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His writings, which have been extensive, have included a series of booklets on "The Case for Creation," published by the Christian Evidence League; papers for the *Pan-American Geologist;* and special papers which appeared in proceedings of the Victoria Institute (London) and of the Committee of the National Research Council on the Measurement of Geologic Time.

FACE OF THE DEEP is the result of an abiding interest and intensive study. The subject—earth's creation and history—requires no highbrow intelligence; all that is needed is plain common sense, in Mr. Whitney's view. To those who may question the validity of statements of fact given in his book he says, "I merely request that doubters look them up."

THE FACE OF THE DEEP

A Defense of Divine Creation

DUDLEY JOSEPH WHITNEY

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To George McCready Price, who, early in this century, showed that the sedimentary rocks and the fossils which they contain were laid down by flood action and not by common processes through long ages; also that there is no true order to the fossils.

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INTRODUCTION

MANY YEARS AGO A SUCCESSFUL INVENTOR SAID SOMETHING like this to me: "No one is likely to invent a tool or a process to replace what is convenient and gives satisfaction." Then he picked up a gadget from his bench and said, "Take this for an example. It is convenient and perfectly fits the purpose that I use it for, for all I can see, so I never think of trying to improve it; but if it were inconvenient in some way I would be figuring and figuring how to improve it."

The principle involved here also applies to theories and beliefs. When a theory in science or philosophy has some feature that is unsatisfactory, thinking men who apply it usually try to find some way that it can be improved and changed. No theory, and no standard belief, should go unchallenged when faults are apparent in it. Either it should be altered to give satisfaction or some other theory or belief substituted for it.

On this basis every effort should be made to revise or completely revolutionize standard beliefs about the origin, age and history of this earth and the solar system of which it is a part, because these theories are riddled with faults. These faults have been recognized to a considerable extent, although they have not been emphasized before the general public, because nothing better seems to be available, though it is. At least, a case for something that seems very much better to the author is to be presented following this introduction.

Standard belief, almost unchallenged, is that the earth and the solar system of which it is a part came into being "naturally" and not by an act, or acts, of a Creator transcending what we call natural processes, and that they have been governed by natural processes ever since.

This belief seems to be held largely as a matter of philosophy: that everything that happens does so because of the influence of matter upon matter according to the properties of matter. The idea was expressed clearly in a symposium, *Creation by Evolution,* written about thirty years ago. In this volume David Starr Jordan, for a long time the noted president of Stanford University, wrote: "Everything that happens in nature is natural, not 'supernatural.' Indeed, to science 'supernatural' is a meaningless word."

Of course on that basis, creation as a divine act is impossible and the universe must operate like an eternally existing, self-winding clock. This is the principle which modern science follows; it is the philosophy of science. The principle is based upon philosophy, not upon anything like full observation.

Full observation would demand, as far as the origin of the solar system is concerned, that we examine all likely or possible theories for the naturalistic origin of the solar system to see how well they could explain conditions. If one theory seemed reasonable and had only trivial faults, we would be justified in thinking that this was doubtless the way that the solar system started. Until a better theory showed up, if it ever did, this kind of origin could well be accepted. However, even in such a case too much dogmatism would be unwise; the road of science is paved with discarded theories.

As it happens, for half a century or so before the ages-theory in approximately its present form was worked out, scholars generally were agreed that the earth and the rest of the solar system evolved into being slowly and naturally by the contraction of a hot, rotating nebula. Belief in that kind of an origin made belief in a long, naturalistic history of the earth almost inevitable; yet if the scientists of a century and a half ago had used their knowledge of physics carefully and critically, they never would have accepted that kind of a start for the earth. Once their successors, something more than half a century ago, did this, they found that the Nebular Hypothesis had to be discarded. No intelligent scientist will now

do it reverence, except for its formerly respected place in the history of science.

But, given the philosophy of science, what are scientists going to do when they find no naturalistic way that the solar system could have come into being? Are they still going to refuse 'creation' on the grounds that 'supernatural' is a meaningless word? Or will they follow pure reason and agree that until a reasonable-appearing theory for the evolutionary origin of the solar system can be devised, at least a tentative belief in real creation should be allowed? True science and true philosophy demand the latter policy.

In the actual history of the problem all naturalistic hypotheses for the origin of the solar system that the puzzled minds of scientists could devise have been weighed in the balance and found wanting. The Planetesimal Hypothesis (in at least two forms) met tentative favor after fatal weaknesses had been found in the Nebular Hypothesis; but this was replaced after a short time by the Tidal Theory. That was dropped after no great length of time, not because a satisfactory replacement could be found for it, but because it was untenable. The best that is offered now is a rather indefinite theory of the contraction of a cold, dark nebula into a hot sun, an earth with a hot interior, and a group of planets, with their satellites. No person upholding this theory would defend it in more than a general way. Serious weaknesses in this theory will be presented later in this work, and the vital question now in the philosophy of science is, whether the inability to account for a condition 'naturally' will justify belief in its 'supernatural' origin, David Starr Jordan and scientists generally to the contrary notwithstanding.

Then there arises the question of the age of the earth, always a puzzling one, and a thorn in the side of the defenders of the old-earth and ages-theory. The ages could not unfold unless the earth were very old; therefore if the earth is not old, the ages did not occur. Evidence will soon be given that the earth cannot be old.

Early geologists also worked on two basic postulates that

are false: that common processes brought all geologic phenonema into being, and secondly, that there is a real sequence to the formations that contain the fossils of plants and animals.

This first postulate debars belief in aqueous cataclysm, or flood action, as the cause of the formation of what we call the sedimentary rocks. Yet belief in aqueous cataclysm, the Noachian Deluge, has come down to us from our earliest ancestors among nearly all races of men, and this seems to provide the only real alternative to ages-geology. Also evidences are abundant of much aqueous cataclysm in the burial of fossils and in the making of the sedimentary rocks generally. Geologists are tending more and more to look to flood action as the way that many sedimentary rocks were laid down.

On the second postulate, that there is a real sequence to the sedimentary rocks and the fossils which they contain, the theory of geologic ages was hardly established before instances and then more instances were found where great sheets of sedimentary rocks were in the reverse order for the ages, 'older' sediments overlying 'younger' sediments in a purely natural way.

And so the matter goes. I will not deal with evidence further here, but with principles and, more than anything else, with the principle of supernaturalism against naturalism. If things cannot be accounted for 'naturally,' a sound principle of science should be to decide that God, the Creator, is responsible for the universe and makes different parts of it do as He wills. If that principle will be allowed tentatively and with an open mind, the following arguments may bring conviction that this earth really came about by creation and that the Noachian Deluge is responsible for the condition of our lands. If the argument is not convincing, ages-geology must be believed in spite of all the evidence against it.

We thus return to the proposition set forth at the beginning: if a theory is full of faults, it should be replaced by something better; at least the faults which it has should be remedied. The great question in the matter at issue therefore is whether ages-geology is good, sound science, or whether it should be replaced by belief in creation and the deluge.

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Thou, LORD, *in the beginning hast laid the foundation of the earth, and the heavens are the work of thy hands: they shall perish; but thou remainest; and they all shall wax old as doth a garment; and as a vesture shalt thou fold them up, and they shall be changed: but thou art the same and thy years shall not fail.*

CHAPTER ONE

THE NATURE OF THE EARTH

IN WORKING OUT THE PROBLEM OF THE AGE AND HISTORY OF the earth the first and most essential thing to do is to learn about its nature. After that, the way it came into being should be determined as well as possible, particularly since the great question to be decided is whether it is very old and went through a long series of geologic ages, or whether it is not old (and presumably created, not evolved), and the sedimentary rocks and the fossils therein were formed as a result of the flood of the time of Noah.

The globe as a whole is like a great stone that has a ball of nickel-iron at its center, along with some other heavy metals and possibly a good deal of iron sulphide, which is abundant deep within the earth. Upon this metal core, which has a diameter of about half the diameter of the earth, rests a thick layer of heavy rock that seems to be composed mainly of the silicates of iron and magnesium, with metallic sulphides, while at and near the surface where the continents stand, granite and closely related rocks occupy most of the space. Under the granite and under the ocean is crystalline basalt, heavier than granite and with a different composition.

The earth as a whole seems to be much like a gigantic meteorite, or aggregation of meteorites, the material of which has been sorted by heat. This view seems to be supported by the fact that the interior of the earth is very hot. But although the temperatures within the earth are high, the earth is nevertheless as rigid as a ball of steel, and except for the ocean and atmosphere there seems to be only one part of the interior that is not solid. This is a comparatively thin layer of vitreous basalt about 35 to 40 miles down where the lands stand and probably closer to the surface under ocean floor. This is the place from which lava and the gases of volcanism come; it is where volcanoes have their roots.

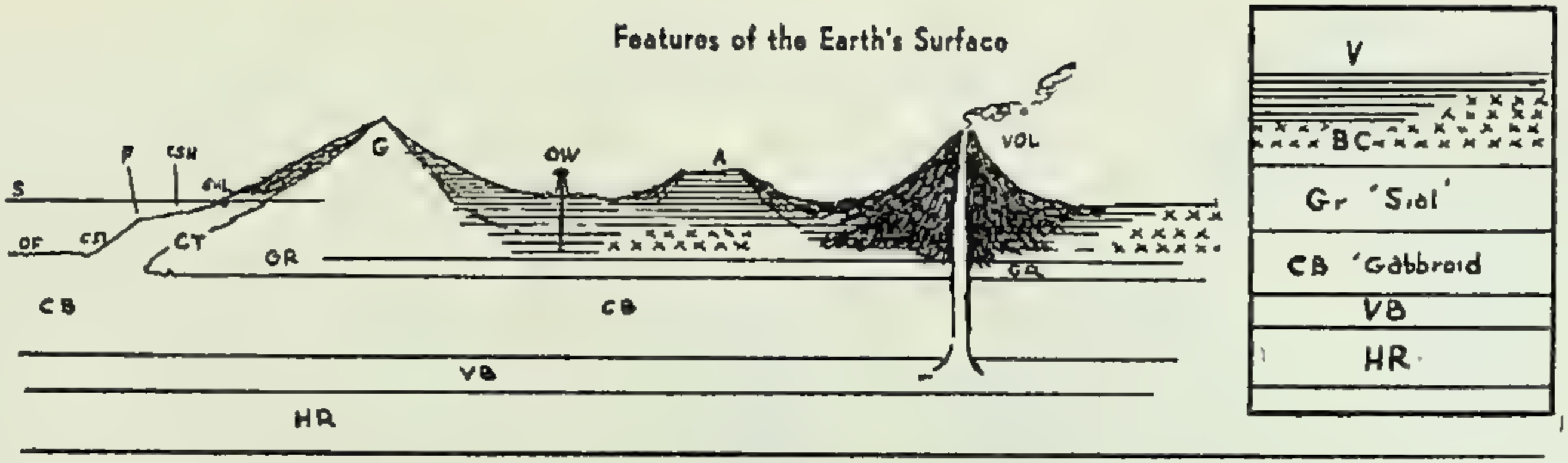
There is some question whether or not the nickel-iron core of the earth is molten or solid. However, this question is more academic than practical, since the great pressure upon the core from the overlying rock makes it act like a solid, and the earth itself, as has been said, seems to be as rigid as a ball of steel, or even more rigid. However, the nature of the earth as a whole is far less important in figuring out its history than is the nature of the upper earth, as will be indicated in the accompanying diagram and its explanation.

Nearly everything in this diagram is significant, either in relation to the origin of the earth or to its later history. As a matter of fact a real understanding of the history of the earth can hardly be obtained without giving due weight to facts shown in the diagram.

At the far right the diagram shows the nature of the various layers of rock of the upper earth where the lands stand. The comparatively thin layer, V, represents the veneer of sediments, lava flows and so on that came into being after true geologic history was well under way.

In some places there is no veneer, but only bare rock, like granite or basalt, that was pushed up to the surface some time in the past. Occasionally the covering upon the bedrock is very thin, being no more than unconsolidated material a few inches or a few feet thick. Volcanic mountains and great lava flows are part of this veneer. Frequently they overlie sedimentary rocks of considerable thickness.

Features of the Earth's Surface



S Sea level

OF Ocean floor

CSL Continental slope

CT Continental terrace

F The fall-off, edge of

CSH The continental

SHL Shore line

G Granite mountain

OW Oil well

A Sedimentary mountain

VOL Volcanic mountain

Light shaded part, sediments

Dark shaded part, volcanic material

(At right) V Veneer

Stippled Basement Complex

GR Granite, the 'sial' layer

CB Crystaline basalt

VB Vitreous basalt, source of

lava, volcanic ash, etc.

HR Heavy rock of earth's interior

In most other places the veneer is composed of sedimentary rocks, the material of which was laid down in the past. Often these are so thick that they go several miles below sea level, and even a few thousand feet below the average depth of true ocean floor, which is about 13,000 feet below sea level, though parts of true sea floor are much deeper than this. In other places sedimentary rocks rise for thousands of feet above sea level, as in the Alps, Rocky Mountains and other great mountain masses that are not formed mainly from granite or from volcanic material.

The frequent great thickness of these sedimentary rocks and the way that they extend downward in places deeper than true ocean floor, and in other places rise far higher above sea level than true ocean floor goes below it, provide seemingly insurmountable difficulties against finding even a plausible explanation for their location and their thickness that will suit the theory of ages.

Also geologists have no reasonable explanation for the composition of sedimentary rocks by the operation of natural processes, since these sediments as a whole are rich in calcium, magnesium and iron; for granite, which is seemingly the 'naturally' top rock of the continental masses, contains only small quantities of these, and rock weathering and later movement of the rock wastes by water tend to carry most of the rock material into the ocean, either as mud or in solution. Calcium in particular is lost to the land. This is the most abundant base of the sediments after aluminum, but much magnesium, sodium and potassium, the latter two bases being plentiful in granite, are also carried into the sea.

Then, too, following ages-geology it seems impossible to understand how as much of the calcium, magnesium and iron as there is in the sedimentary rocks ever got to the surface of the earth in the first place, above the thick, hard granite, since these are elements which are plentiful only deep in the earth's crust (or in the sediments), and volcanism would seem to be the only agency that could bring them to the surface in great amounts. But the calcium, magnesium and the iron of the sediments cannot have come by volcanic

activity, for it is impossible that volcanic activity could have brought more than a small fraction of rock material of the mass of the sediments to the surface; and if it had brought the material of the sediments to the surface, most of the calcium and much of the magnesium, sodium and potassium in them would now be in solution in the sea or mud on sea floor.

Geologists therefore have no right to ask us to accept their theory of an old earth and long ages until they account for conditions like these. If they have an explanation, it does not seem to have found its way into the textbooks.

Underneath the sedimentary rocks, in many places at least, is what is called the basement complex, BC, the nature of which is shown over the Canadian Shield, where it is bedrock over most of the area from the Great Lakes country northward and eastward. Exposures of it also are found near the bottom of the gorge in the Grand Canyon and of course in many other places.

This basement complex seems once to have been a semi-fluid mass, under high temperatures and with a high moisture content (otherwise it would not have been in a more or less fluid condition), composed of granitic and basaltic gneiss, sheets and masses of calcium carbonate, dolomite and various other materials, that was intruded by lava flows, masses of metallic ores from deep in the earth, and various other materials. How the original material of the complex could be so soft and subject to intrusion by the material of the intrusives when thick granite presumably underlay it is one of the most important problems in geology, and modern geology provides no explanation for this as far as textbooks in geology show.

There is no telling, of course, where part of a basement complex exists under sedimentary rocks and where these rest directly upon granite or basalt, except where the complex is exposed.

As has been said, under the granite and under true sea floor is crystalline basalt, much like granite in many ways, but containing appreciably less silicon, aluminum, sodium

and potassium and appreciably more calcium, magnesium and iron. Under the crystalline basalt is the vitreous basalt, VB, which, judging from the composition of lava and other volcanic solids, seems to have about the same general composition as crystalline basalt, except that it is heavily charged with steam and other gases. This, with its high temperature, makes it the main source of lava, volcanic gases and other volcanic material.

The earth's 'crust,' so called, properly begins at the crystalline basalt, but, anticipating somewhat, it would seem more than probable that at the beginning of geologic history, before volcanic activity had taken any steam and other gases of the newborn earth to the surface, the now comparatively thin vitreous basalt extended far deeper within the earth and came far closer to the surface than it does at the present time, even well into the 'sial' or granitic layer, the rock rich in the silicates of aluminum, sodium and potassium. Indeed, it must have extended into what is now called the basement complex; otherwise lavas and other intrusives from deep in the crust could not have penetrated it. (Right here it should be stated that the term 'gabbroid' applied to the basaltic layer of rock under the granite is taken from the name of a kind of basaltic rock, gabbro, rich in calcium, magnesium and iron.)

The general term 'heavy rock' is applied to the rocks beneath the vitreous basalt partly because, assuming that the material of the earth was sorted by heat, the heavier minerals would tend to settle toward the center of the earth and the lighter elements or substances would tend to gather near the surface; and investigation shows that the deep-seated rocks are heavy. Since in meteorites the four most abundant elements by a wide margin are oxygen, silicon, iron and magnesium, with sulphur a very poor fifth, it is assumed that the heavy rock between the earth's crust and the iron-nickel core of the earth is composed mostly of the silicates of iron and magnesium, along with large quantities of iron sulphide and other metallic sulphides.

In this brief view of the general nature of the earth's crust where the large land masses stand, and its nature be-

neath the ocean, where granite is missing and the crust is composed, seemingly, of basalt only, the question arises how such a radical difference came into being between the parts of the earth's crust under sea floor and where the continental masses stand. Ages-geology seems to offer no explanation, valid or invalid, of how these differences would arise during an assumed cooling of the globe from a molten to a solid condition. Nevertheless some explanation should be found for this before geology can be considered a science rather than a mass of fairly well determined data tied together by cords of highly speculative hypotheses.

Surface Features of the Earth's Crust in Detail

From the general nature of the earth's crust where the main land masses stand we now turn to the main part of the diagram. The various parts of this indicate only general conditions and they are not in correct proportion to one another as to size, shape and so on.

We begin at the far left with true ocean floor, which normally varies from a few thousand feet to more than three miles down. Even there it is cut in places by trenches, some of which reach to a depth of six miles or thereabouts, and the surface of ocean floor in general seems to be about as irregular as the land surface of the continents.

Possibly the most important thing that the diagram shows is that the land masses do not rise directly from ocean floor (OF) to the shore line, even when high mountains rise abruptly from the shore line, as is the case over most of the west coast of North and South America and many other parts of the earth. Instead, a distinct and fairly steep slope (CSL) starts upward from true sea floor a few miles from land in some places and 200 or more miles out in other places and continues upward until it reaches a depth of just about 600 feet below sea level. Then, at the point F, the fall-off, it flattens out almost like a floor, becoming gradually shallower until it reaches the shore line, SHL. The depth of water there depends upon currents and wave action.

This flat area, CSH, is called the continental shelf. It is one of the most amazing and significant features in geology. Though flat, it is cut in many places by deep submarine canyons, and near the edge by trenches or gulches. The part of the continental mass under the continental shelf and slope is called the continental terrace, and this can be considered as continuing inland where flat, low plains border a shore, to the place where hills start to rise (CT).

Granite underlies much of the continental terrace out as far as the continental slope, although the granite along the face of the continental slope usually is a weak kind of granite. In other places 'sedimentary rocks' underlie the surface. More on that later.

A very important question on all this is, How did the continental shelf and terrace come into being in the first place? and a second question is, How does it happen that, during long ages, with rock material from the interior being carried continually by rivers to the sea, this continental shelf was not covered with silt long ages ago? No answer to these questions seems to have been offered; apparently none can be given.

The diagram also shows roughly the surface features of the land masses in connection with the foundation rock of the land masses. At G is a granite mountaintop, with bare upper slopes, but with sediments or other parts of the 'veneer' covering the lower slopes and the deep, foundation granite. Farther to the right is a sedimentary mountain, A, that was pushed up for perhaps thousands of feet after the sediments were laid down, while between the two mountains are deep sediments in which an oil well, OW, has been drilled.

Still farther to the right, volcanic activity has built a high volcanic mountain, VOL, and volcanic ash and lava flows have covered both granite and sediments. At the extreme right the basement complex has come to the surface, and in other places it is shown underlying sedimentary rocks or other parts of the veneer.

The features shown by the diagram provide a mass of difficult problems in the study of geology. Some relate to chemical problems and deal with the composition of the upper

rocks after so many of them supposedly have been subjected to weathering and the movement of rock wastes to either low lands or the sea. Others relate to hypothetical movements of the earth's surface by which, on a globe as rigid as a ball of steel, mountain range after mountain range has been uplifted and worn away, as in ages-geology, or subjected to one great remaking after a real creation following a great aqueous cataclysm, the Noachian Deluge.

In view of the problems suggested by conditions indicated in this diagram, a comparison of the merits of the two kinds of origin and history of the earth should be enlightening.

Our detailed study of the problems suggested in this diagram can well start with an examination of

The Nature of Sedimentary Rocks

These are classified in two ways, as everyone knows who has studied geology: first by their nature, as shales, sandstones and limestones, with conglomerate, which may be classed as a kind of a coarse sandstone, with many of its particles being rocks of considerable size. Geologists also classify them according to their supposed ages: the eras, periods and epochs during which they were deposited according to the ages-theory.

Irrespective of how they are classified they frequently are thousands of feet thick, as the diagram shows. In oil fields wells have been drilled to a depth of more than 20,000 feet before striking crystalline rock, and physical tests indicate that sediments may extend thousands of feet deeper than this in places. This includes sediments that, if ages-geology is based on valid theory, must have been laid down scores and hundreds of millions of years after ocean and land had come into being and common geologic processes of rock weathering and sedimentation had begun.

Our oil fields show this. Most of these are in sediments of the so-called Tertiary periods and the Cretaceous period preceding them (according to the ages-theory). These together include only the last few percentages of geologic time as the

age of the earth is now taught, and we have noted how deep oil wells have been drilled in these sediments.

As has been said earlier, not only do comparatively recent sediments extend for thousands of feet below the ground level, but they rise three, four and more miles high. In the Alps they seem to do both, according to the way that the sedimentary strata of the French Alps are pictured in a diagram from a formerly well-known textbook of geology. (Grabau, *Textbook of Geology, Vol. I.*)

But what are sedimentary rocks of great thickness doing above sea level on continents anyway? The question should be answered in the light of what is occurring now, particularly since uniformity—the dictum that the present is the key to the past—is the basic postulate of ages-geology.

What takes place now is that mountains and hills are continually being lowered by the weathering of rocks, and the wastes are carried into low lands and the sea by brooks and rivers. But rock wastes from the land make nothing like the sedimentary rocks of so-called past ages, except to a very small degree. Any person who has lived in or near mountains and has watched streams flow can see this.

Rock wastes are of three very distinct kinds. Look at a stream as it passes from the hills or mountains to flat land. In time of heavy flow it will be muddy. The mud will be composed of very finely divided matter that is actually carried by the moving water. When the water ceases to move, or only moves slowly, this material will settle out as a mud, but this kind of material makes up only a part of the shales, which form the larger part of the sedimentary rocks. It makes up only one part of the rock wastes.

Look at the same stream after the flood has subsided. Although in typical mountain streams the water then will be clear, or contain mere traces of mud, the stream still carries down rock wastes of other kinds. Great quantities of certain substances pass off in solution. More than half of this soluble substance is calcium carbonate, or at least calcium and carbonate. The next most abundant material is sulphate (SO_4), then comes soluble silica (SiO_2), and lesser amounts of

sodium, chlorine, magnesium, potassium and some other materials. The total amount of soluble material carried from the lands to the sea per year has been estimated as 2,735 million metric tons. That is a lot of material. Such material goes to the ocean. It does not form sediments on land. To the extent that sediments of the past were laid down on the land they would, or could, contain very little calcium carbonate. They surely would contain very little magnesium carbonate, which is practically insoluble in cold water, and they would be deficient in sodium, magnesium and potassium. Yet the sedimentary rocks are well supplied with all these.

The remaining part of the rock wastes goes downstream in solid particles of various sizes. Following a heavy flow in a mountain stream the water mostly runs clear; little suspended matter is carried by the water, yet when a person looks at the stream bed at such a time where it flattens out, he will see sand being pushed along the bottom at a good rate, mostly in rather large grains. He will almost never find stones of marble size or smaller on such a bottom, for the large rocks that are rolled along a stream bed quickly wear away into a sand, and the large sand wears down to fine sand and the fine sand to a silt, and that settles when the stream reaches lake, bay or estuary.

No conglomerate is formed by normal rock weathering and sedimentation; instead, rounded rocks that are subjected to the movement of water in time are worn to silt. No great masses of sand are deposited by normal rock weathering, unless it be along beaches near some headland that is being worn away. Rock weathering does not form typical shales and it does not bring great masses of sandstone into being, and the calcium carbonate, save for moderate amounts which remain in the muds and silts, goes down, not within the continental masses, but on the floor of the ocean. This is plain.

The men who worked out the ages-system of geology must have seen all this without ever realizing its significance. If they had thought about it, and had known how to reason, they never would have devised the theory of geologic ages.

Again, rock weathering does three things. It lowers the

higher lands, fills the depressions and pushes the shore line ever seaward. Once the depressions, if any, in the surface of the original continents were filled there would be no depressions left in which great quantities of sediment could be deposited; neither would new mountains arise by any known agency except volcanic activity. Volcanism would not uplift mountains of sedimentary rock, neither would lava and other volcanic material, after weathering, produce the materials that make up most of the sedimentary rocks.

There are other objections to having volcanic rocks as the source of the sedimentary rocks that now exist. One would think, reasonably, that the amount of eruptive material within the earth would be too limited to keep geologic processes going for many thousands, to say nothing of millions, of years. Next, the sediments would be laid down at the edge of the lands upon the continental shelf or slope, or on true sea floor itself, and none of these sediments, except beyond the continental terrace, could be thick. Last of all, for now, is the fact that the sediments would not be of such different types as shales, sandstones, limestones and conglomerate, but just mud, or the kind of silt that is commonly deposited in river deltas like those of the Mississippi, Nile and Colorado Rivers.

The last-named river is of special value in this connection since the lands of the Imperial Valley of southeastern California and parts of Mexico adjoining were made by river flow within, probably the last thousand years or so, and if a person wishes to see what the material of a delta of a great river looks like, he can do so by visiting this valley. Some areas have a somewhat lighter soil than other areas, but mostly the surface is a stiff clay loam and there is no alternation of sheets of shale, sandstone and limestone such as is common in stratified rocks; nor could these form at the mouths of great rivers where most of the suspended matter from the present lands is now deposited.

Possibly the most important feature of all this (as far as the issue between ages and Deluge is concerned) is the fact that the theory of geologic ages is built mainly upon the proposition that there is a true order to the sedimentary rocks. But

if these so-called sediments were not laid down gradually following rock weathering, the whole theory of ages collapses, and we have seen that common processes could not have formed these shales, sandstones, conglomerates and limestones. The breaking up of parts of the crust of the earth by water, under high temperature and pressure, was responsible for the Deluge of Noah's time, to the extent that natural processes caused that cataclysm.

CHAPTER TWO

THE CONTINENTAL TERRACE AND GEOLOGIC HISTORY

MANY THINGS ABOUT THIS EARTH WOULD SURPRISE US IF WE viewed them intelligently instead of taking them for granted. It is difficult to say what feature of the earth, as viewed from the standpoint of geologic history, is the most surprising, but the continental terrace that surrounds the great land masses is a candidate for first honors. This is particularly so because of the way that it supports the Deluge theory and gives evidence of the recent uplift of the lands.

The continental terrace, as shown in the diagram given earlier, is that part of the continental mass beyond the shore line that rises above true sea floor. As has been said, its surface from the shore line out to a depth of about 600 feet is almost flat, no matter how irregular the contours are inland from the shore line. It is, however, often cut by submarine canyons with fairly steep walls. These extend through the terrace almost or entirely to true sea floor.

Many of these canyons are the extension of river beds like the Hudson Canyon, an extension of the Hudson River bed, or the Congo Canyon in Africa, an extension of the bed of the Congo River. Clearly, then, these submarine canyons must

have been formed at the time that the lands through which the rivers run were uplifted, and that is not long ago. They have not existed through long ages otherwise they would have been filled with sediments from the lands. The continental terrace itself therefore must have been formed or remade recently. And besides the true canyons there are also numerous furrows or gulches at the edge of the terrace, where the continental slope and the continental shelf meet. All these gulches, according to R. A. Daly of Harvard University in *The Floor of the Ocean,* show an appearance of very recent origin.

This is only part of it, and not the most significant part. In a diagram Daly pictures conditions along the coastal plain of southern Louisiana and out over the shelf in the Gulf. The diagram seems to show conditions for a distance of about 200 miles, with the shore line close to the center.

This is an oil-producing area, with wells both on the coastal plain and out on the shelf. Borings were made both on the plain and the shelf. Using the terms geologists use to designate the different formations, the time when the material penetrated by the wells was deposited was astonishingly recent. Far out on the shelf the wells started in Pliocene or Pleistocene sediments, no distinction being made between these, and by ages-geology the Pleistocene period ended only a few thousand years ago. That makes this material out from the land, under the shelf *and for some thousands of feet down* little more than a few thousand years old—if it is Pleistocene, as it seems to be.

Nearer the land the wells started in older sediment (by the ages-theory, but not by the Deluge theory): Miocene, Eocene and Cretaceous, the latter back on the coastal plain. Yet all of these are very recent, as geologists figure time, having been laid down in the last few percent of geologic time. These holes went down six, eight, ten and eleven thousand feet, and that is a lot of sediment to have been provided by the wearing away of ancient mountains, no matter how much time was available for the work, and no matter how high these mountains had been pushed up within the continental mass. The thing simply could not happen; the only way to account for

these conditions is by the remaking of the lands and the part of the continents beyond the shore line by a great Deluge a few thousand years ago in which the lands and the floors of shallow seas were broken up from beneath and the present lands then uplifted.

There is this too about the continental shelf; it would have been covered with mud and silt from the land if the lands had been uplifted from below sea level say a few tens of thousands of years ago, or less. But it is not; areas exist near the outer edge of the shelf where there is no mud from the lands, and the surface is rock; water-rounded rocks are plentiful on it. These could not have come from the land; they must have come from the Deluge cataclysm. In other places muds from the land not only reach the edge of the shelf, but extend down over the slope.

As I started to say above, if the continental shelf as it is had been formed long, long ago muds from the land should cover it by now. This is evident when we think how fast rock wastes are being carried from the land to the sea, and when we note how shallow the shelf is. The depth at the edge of the slope is approximately 600 feet in most places, which would make its average depth 300 feet or a very little more. Yet Arthur Holmes in *The Age of the Earth* says that Britain is being lowered at the rate of about 350 feet per million years, which would reduce the island to sea level in a million years. North America is being reduced in height at not far from the same rate. The lowering of Britain in a few thousand years might not put a great deal of mud on the shallow sea floor around it, but the lowering of a great continent like North America would put a lot of mud on the shelf around it; yet much of the outer part of the shelf surrounding it is not yet covered with mud; therefore the lands were uplifted not very long ago.

A good way to see the bearing of the flat, shallow continental shelf upon a proper understanding of geologic history is to take an area along the edge of a large continent and see the differences between the lands, the continental shelf

and the slope from it to deep sea floor. This can be done easily and well by the study of a map issued by the National Geological Society in October, 1953, of the China Coast and Korea, in which the depth of shallow and deep sea floor is shown.

Across the Yellow Sea from China to southern Korea for a distance of more than 300 miles the deepest water is little more than 300 feet deep. Farther north, in the Gulf of Chihli, really part of the Yellow Sea, more than 250 miles from north to south and with an average width of about 100 miles, the average depth is less than 60 feet. Hardly anything could be flatter. The average depth of Korea Bay, of about the same size, seems to be less than 200 feet. The sea floor between southern Korea and Japan is less than 400 feet deep and sea floor between Formosa and Japan averages less than 200 feet deep. Thus it goes: for scores and even hundreds of miles the sea floor is shallow and almost flat until the 100-fathom (600 foot) mark is reached, and then the floor slopes rapidly down, to a depth of more than 24,000 feet in one place southeast of Okinawa.

Flat and shallow as these wide seas are, the land rises from its surface rugged and uneven. Not far from the shore, mountains rise to a height of a mile or more in China, Korea and Japan. Two mountains in Japan in the area shown on the map rise to more than 10,000 feet. The land surface is often rugged, but the sea floor is shallow and flat; yet all is part of a mass that stands like a great tableland high above true sea floor.

Sound theorizing should be done on this. Ages-geology has thirteen geologic periods starting with the Cambrian and ending with the Pliocene, in each of which two or more miles of rock weathering and sedimentation have occurred in some part of the earth or other; yet in all of this time flat sea floor must have bordered eastern Asia without material uplift or subsidence and without being covered with rock wastes from the land—or else the Noachian Deluge came along a few thousand years ago and left the lands as they are.

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Ages-geology surely seems improbable. Better by far do away with the ages-theory altogether and accept a recent creation and the Deluge.

But how did this continental shelf come into being? What place has it in the theory of ages? How can it be explained on the basis of a recently created earth and the Flood? This last question is one of the biggest questions in geology, provided Deluge geology is to be given any consideration at all. An attempt will be made to answer it after an examination of one of the most basic problems in geology, that of the probable age of the earth.

CHAPTER THREE

THE AGE OF THE EARTH

THE APPROXIMATE AGE OF THE EARTH HAS ALWAYS BEEN A problem with geologists. Their basic postulate is that processes such as operate now operated to form the sedimentary rocks, and that such rocks are very thick as they now stand in coal and oil fields and on mountains. On that basis a great length of time would have to pass to form them.

When the thickness of these rocks is figured on the basis of their having been laid down during a series of ages their calculated thickness is multiplied. In Great Britain alone Cambrian and Ordovician sediments are each said by Arthur Holmes in *The Age of the Earth* (Nelson, 1937) to be 40,000 feet thick. (The thickness of pre-Cambrian sediments is figured as being far greater than that of all Post-Cambrian sediments, but we will not deal with them. Holmes says that the thickness is unknown but enormous.) Devonian sediments (I skip the Silurian) are said to be 37,000 feet thick, and Carboniferous sediments 40,000 feet thick; all in Britain. Cretaceous sediments in the Rocky Mountain region of the U.S. are said by Holmes to be 64,000 feet thick.

From the standpoint of terrestrial mechanics, the for-

mation of sediments even a small fraction of such thickness by ordinary process on a rigid earth is impossible. But our problem now is not the mechanics of the thing, but the time that would be required to wear away rocks enough to make such thicknesses of sediment and to deposit such sediment. A large piece of Eternity would be needed for that, so unless the earth is almost unbelievably old these sediments were not laid down by common processes, but by the only apparent alternative, Deluge cataclysm.

Our first problem is, How is the age of the earth to be determined? An early and logical method of estimating this was by studying the increase of sodium in the ocean; but let us be more logical than the geologists and chemists of a few decades ago, and than they are now, and consider other substances in the ocean as well as sodium.

The standard figures on this are given in the U.S.G.S. Bulletin 770, "The Data of Geochemistry," by F.W. Clarke. Present-day chemists may think that these figures should be modified somewhat, but they are at least of the right order of magnitude. What they signify should be allowed.

Clarke tells how much of various 'ions' are carried into the ocean each year; also the amount of these ions in solution in the ocean, for much of the soluble matter of river water is precipitated after it reaches the ocean. This is true of practically all the calcium carbonate, the silica and the oxides of iron and aluminum. It is not true of the sulphate, nor the magnesium and the potassium, the latter two of which are comparable in amount with the sodium that enters the ocean in river water from the weathering of rocks. (The major part of the sodium in river water seems to be cyclic—combined with chlorine and formerly within the ocean, either when the lands were forming or more recently.) And now for figures on this.

THE SALTS OF RIVER AND SEA WATER

Substance	Addition to ocean per year in metric tons x 1,000	Metric tons in ocean x 1,000,000,000,000
Carbonate (CO_3)	961,350	95.6
Sulphate (SO_4)	332,030	3,353.0
Chlorine (Cl)	155,350	25,358.0
Bromine (Br)	——	86.8
Nitrate (NO_3)	24,614	——
Sodium (Na)	158,357	14,130.0
Potassium (K)	57,982	510.8
Calcium (Ca)	557,670	552.8
Magnesium (Mg)	93.264	1,721.0
Misc. (Fe, Al, etc.)	75,213	——
Silica (SiO_2)	319,170	——
Sum	2,735,000,000 tons.	46,183,000,000,000,000 tons.

The most significant substance in this table in most ways is not sodium, but sulphate. It is practically as soluble as sodium, and although it enters the ocean more than twice as rapidly as sodium, there is less than one-fourth as much in the ocean. Sulphate, therefore, limits the possible age of the ocean at least eight times as much as does sodium. In addition it keeps potassium and magnesium from being taken out of solution from sea water, thus making the magnesium and potassum in sea water limit greatly the possible age of the ocean too.

Clarke in a few comments seems to realize that other substances besides sodium limit the possible age of the ocean, but he makes no special effort to reach a decision upon the matter —his task is only to present the facts of geochemistry.

But before discussing details of the table, two basic features of the problem need to be emphasized. First, to the extent that the early ocean was supplied with any of the substances mentioned, the annual increase of that substance provides, not an estimate of its age, but a *limit to its possible age*. Geologists almost without exception seem to have done their figuring on the supposition that the ocean was composed of fresh water from the beginning, but this was a mistake. Geo-

chemists now almost all believe that the ocean was saline from the beginning, and on that basis any great and continual increase in the amounts of any one of the soluble substances limits greatly the possible age of the ocean. Most of the chlorine was in the ocean to begin with; therefore most of the sodium, magnesium and potassium was there too, to say nothing of the sulphate.

As far as sulphate is concerned, considering the way that heat decomposes or volatilizes sulphur and its compounds, and considering the great quantity of sulphur within the earth, and the fact that the materials composing the earth seem to have been sorted by heat, it is surprising that sulphur and its compounds are not more abundant at the surface of the earth than water.

Seemingly only the miracle of creation could give the ocean such a small content of sulphates, particularly since sulphate is entering the ocean more than twice as rapidly as chlorine.

These features merit attention: an enormous quantity of sulphate enters the ocean from the air. Clarke does not try to estimate this, though he gives some data upon the amount of SO_4 in the annual rainfall in certain places. This presumably enters the ocean (when it enters the ocean from the air) either as ammonium sulphate or as an oxide or acid. The nitrogen of the ammonium is taken up by marine plants and the sulphur ends up as potassium or magnesium sulphate. What is taken up by plants goes back into solution when they are consumed, mere traces remain in marine muds, though great quantities would be found there if a large part of the sulphur of sulphates went out of solution permanently. Therefore we have the condition that sulphate from river flow is being added to the ocean more rapidly than any other soluble substance and, considering the enormous output of sulphur and its compounds from volcanic action, most of it entering the ocean directly and not from river flow, the ocean cannot be old, and a different history for the earth from what the geologists offer us should be believed. Hardly a thing proves the youth of the ocean and the earth as much as the great annual

increase of sulphate in the ocean and the comparatively small amount there.

The Nature of the Early Ocean

But before dropping the general subject a few comments on the part of sodium, chlorine, magnesium and potassium are in order.

Little chlorine is found in the crystalline rocks and little comes from volcanoes. Therefore most of the chlorine of the earth must have been in the ocean from the beginning; and since most of the chlorine of the ocean is combined with sodium, presumably sodium chloride must have been the main salt of the ocean from the start. If there was much sodium chloride in the beginning there would be much of the other soluble material: sulphate, magnesium and potassium. This would reduce greatly the time needed to give the ocean its present saline content.

The amounts by weight of sodium and chlorine are about equal, sodium being in the lead. Allowing for the difference in the atomic weights of these two elements it would seem that approximately one-third of the sodium in river water is juvenile—derived from rock weathering. This would make the net annual gain of sodium, magnesium and potassium in the ocean of about the same order of magnitude, and allowing for a saline ocean to begin with, this should make the ocean young indeed, too young for the geologic ages. And in this connection the fact must be emphasized that none of these elements are being removed from solution in appreciable amounts; analyses of marine muds and oozes given by Clarke show this. Furthermore, the great increase of sulphuric oxide as an acid in the ocean each year would tend to bring these bases into solution instead of precipitating them.

The Ocean Itself Is Young

Not only does the rapid increase of the soluble salts of sea water show that the earth is not old, but the rapid in-

crease of water itself in the ocean shows that the ocean is young. If the increase of water in the ocean in the past by the old-earth theory had been as great as it is now—and it must have been more rapid in the past than it is now—the ocean would contain far more water than it does.

The amount of water that issues from a volcano in eruption is surprisingly great. Of course no measurements of this are possible, though amounts issuing from a small vent have been measured. The most notable measurement was made in the preceding century from one of the numerous parasitic vents of Etna, in Sicily. One hundred such vents operating for 1,800 million years (which was the supposed age of the earth about twenty-five years ago) would provide all the water of the ocean, according to Alfred C. Lane in his presidential address to the Geological Society of America in 1931. Yet there are many such vents on Etna, and Etna is only one of hundreds of active, or recently active, volcanoes.

Certainly, too, most of the water of the ocean must have been there when the earth formed with seas and lands, so that true geologic history could begin. We have seen that nearly all of the chlorine was at the surface of the earth at the start and it would be absurd to suppose that most of the chlorine would be at the surface at a time when most of the water of the ocean was still within the earth.

The water of the ocean is sufficient to cover the globe to a depth of 8,600 feet, and a large amount of that water simply could not be within a hot earth after the crust had hardened. If by some miracle it was there, it would soon break forth.

If an appreciable fraction of the ocean water was within the earth after true geologic history began, much of it would surely be beneath ocean floor, from which it would soon break forth. Yet when we note the islands of the ocean we find none that give evidence of being even a million years old, to say nothing of hundreds of millions of years old; most of them, not including coral islands, when they are not actively volcanic, contain volcanoes that bear evidence of having been active not long ago. If the ocean were old, volcanic islands

would not have waited for hundreds of millions of years to come forth.

This matter is so important in relation to the possible age of the earth that it seems impossible to emphasize it unduly. Consider the areas where geysers are active: Iceland, New Zealand, the Yellowstone. The question here is not so much how much water is added to the oceans by them, as to how long such outpourings of water from within the earth could continue. A very few thousand years would seem to be the outside limit of activity, particularly when one keeps in mind what a great outpouring of water from within the earth there must have been during the crustal disturbance that broke up the earth's crust in the first place and then uplifted the present lands.

Note also the great quantity of sulphurous gases that are brought to the surface in volcanic action, to say nothing of the numerous sulphur springs here and there over the lands. If water has been coming from within the earth for hundreds of millions of years, sulphur must have been entering the ocean for all that time and the ocean then would contain many times as much sulphate as it does.

The Loss of Calcium Carbonate from the Land

The enormous quantity of calcium carbonate removed from the land each year is also very significant in limiting the possible age of the earth. It is the equivalent of about three-fourths of a ton of limestone per year for each inhabitant of the globe. At this rate of denudation a few thousand years would remove most of the carbonate available to easy weathering, and after that the calcium removed by the weathering of granite, basalt and such massive limestone as was exposed to the air would be comparatively small. The great amount of calcium carbonate now carried from the lands to the sea by river flow can only be accounted for by the recent uplift of the lands and the fact that the earth is not old.

The great quantity of calcium and magnesium carbonate

still in the lands is noteworthy when the early condition of the lands by the ages-theory is considered. No land vegetation to protect the land surface existed, for all that can be seen, until comparatively late in geologic time. Alternating heat and cold could do its work easily in breaking down a rock surface. Since no land plants were removing carbon from the air then and tying it up in coal or in shales, the air must have been extraordinarily rich in carbonic acid which, as now, would disintegrate silicates, allowing the carbonates to be carried in solution to the sea. Volcanic activity would be much greater on a young than on an old earth because internal gases would be more abundant and closer to the surface; so more sulphurous gas would enter the air then than now to provide acids to help disintegrate the rocks. From every angle ages-geology is discredited when the matter of the rapid leaching of soluble salts from the land is considered.

There are other reasons for holding that the earth (and the solar system as a whole) is not old, and they will be taken up later, but another factor enters the picture here which is of vital importance; namely, radioactivity in relation to the age of individual rocks and to the age of the earth as a whole. We will take this up now.

Radioactivity and Earth's Age

There is no need to undertake a comprehensive discussion of this problem since a few features of the case seem so clear and conclusive that a greater coverage of the problem should be unnecessary.

The principle involved in figuring the possible age of a rock is this: uranium and thorium each disintegrate slowly, but at definite rates, into lead and helium, so when the amounts of uranium, thorium, lead and helium are found in a rock, the age of the rock can be figured. This is expressing the case in the simplest possible way, ignoring qualifying factors. But note this: the 'age' of the rock is not the age of the rock material, but the time since that rock material came into place and hardened into rock. For instance, the uranium

and thorium minerals found in a dike were presumably forced there in a plastic or semifluid condition. Before the intrusion the material was probably in what is now called the basement complex. (There is but little uranium and thorium deep in the earth's crust, in the vitreous basalt that is the source of most volcanic activity. Uranium and thorium tend to be associated more with granitic than with basaltic material.)

We find dikes containing a good deal of uranium and thorium penetrating various kinds of rocks in hills and mountains. This penetration must have occurred when the mountains were uplifted, and simple observation shows that the hills and mountains the world over must have been uplifted at the same general time, and that not long ago. Therefore all the dikes should show approximately the same age by radioactivity, and of course they do not.

Also the uranium and thorium of the earth have been within it since the earth took form, producing lead and helium by radioactivity continuously since then; and while they were within the earth's crust no opportunity to escape was available for much, at least, of the lead and helium produced during the earth's early ages; and this brings us to the most basic objection to the theory of radioactive dating of rocks.

For the lead and helium content of uranium and thorium minerals to have true value in indicating the age of the rock, all, or at least nearly all, of the lead and helium that had been produced by radioactivity during the earlier life of the parent metals would have to be expelled from it before it intruded into its present position. That should be clear. But it was not expelled. Where could it go? The parent metals and other rock substances with them would all be in solid rock or in a pasty mass within the earth's crust. All of them together would be forced into the fissures and harden into rock there and helium and lead associated with them when they were analyzed in a laboratory would give no evidence whatever of the time that the dike was formed—or the time that a sill of basalt came into being.

This is the theory of the thing and facts sustain the theory. Time after time in the reports on the composition of different

radioactive rocks given in the annual reports of the Committee on the Measurement of Geologic Time, common lead (Pb204) is listed in appreciable amounts. It is held to have been with the uranium and thorium from the beginning; therefore radiogenic lead formed during the early history of the earth would stay with the uranium and thorium too; it would not be expelled from the rock material when it was forced up toward the land surface and the amounts of lead and helium found there now are of no value in even suggesting the possible age of the rock. Much more could be said on the subject if it were necessary.

Looming behind all this is the way that the nature of volcanic activity, the rapid increase of saline matter in the ocean, and the rapid leaching of calcium carbonate from the land proves that the earth is not old. Either these evidences have to be cast aside or radioactivity estimates should be. If there were any doubt about which line of evidence should be followed, a decision should be reached upon the basis of which picture of earth history appears the better: an old earth and ages, with uniformity operating, or a recently created earth and one great aqueous cataclysm to bring the face of the earth into its present condition a few thousand years ago. Let us now examine that position, postponing for a while the problem of the origin of the earth and some other problems that must be faced if a clear view of the general course of geologic history is to be obtained.

CHAPTER FOUR

EARTH HISTORY BY DELUGE GEOLOGY

LET IT BE AGREED THAT IF DELUGE GEOLOGY IS TO BE BElieved, the creation of the earth and the world as an act of God rather than by the operation of natural processes must be allowed; also the world could not be as it is except by divine ordering unless it was almost unbelievably old. Nevertheless, in this part of our study I am going to give the case for Deluge geology as against the ages as far as possible upon the basis of the operation of natural processes.

Let us begin with an initially hot earth, without trying to find how such an initially hot earth came into being. The interior of the earth is very hot and the material of the earth seems to have been sorted by heat, so it seems reasonable to postulate an early earth of this kind.

Heat turns water into steam. In a hot earth the water and other gases in it would tend to be driven to the surface, either to form part of a dense atmosphere or to escape into space. But the water of the earth did not escape into space; otherwise it would not be here now, so presumably most of it was part of an immense atmosphere while the surface of the earth

was at a very high temperature—above the critical temperature of water.

The water of the present ocean is sufficient to cover the face of the earth to a depth of about 8,600 feet, and that much steam or water vapor would press down upon the face of the earth with great pressure. With it would be, probably, most of the chlorine of the present ocean as hydrochloric acid, and also great quantities of carbonic acid, much nitrogen, bromine and some other substances. A great, acid atmosphere would press down upon the (presumably) molten face of the globe and act upon it physically and chemically.

Under such pressure the face of the earth would not harden into rock like lava because the acids of the atmosphere would combine with the basic elements of the upper earth, such as calcium, magnesium, sodium, potassium and aluminum. Steam under high pressure also tends to dissolve silica—the two go into mutual solution. There would be over the face of the whole earth a deep, hot ocean containing great quantities of the hot silicates of aluminum, sodium, potassium, calcium, magnesium and iron; also great quantities of calcium carbonate and smaller quantities of magnesium carbonate, and the sulphates of calcium, potassium and magnesium. From this mixture the early lands and ocean would form.

Leading physicists, like Harold Jeffreys of Cambridge University, seem to believe that the earth, early in its history, was covered with a hot water-glass ocean, and Jeffreys in an early edition of *The Earth* stated that most of the water came from within the earth. If he had said "much of the water of the ocean" instead of "most of the water of the ocean" I would agree with him more than I do. The matter is not overly important, except that a decision should be reached whether the early hot earth was so hot that it had no water at the surface and all of the ocean later worked its way to the surface from deep within the globe, or, as I am holding here, that the early hot earth had a dense, acid atmosphere which ate its way deeply into the earth. A decision should be reached on this.

Having an early hot ocean like the one described, the

problem is to see how its cooling would result in the formation of great land masses and deep ocean floor; and simple physical chemistry provides the answer.

Hot water will hold some salts in solution that would precipitate out in cold water. Also, high pressure will hold salts in solution that will precipitate out under low pressure. The nature of deep sea floor will show how this works. At the upper levels of true sea floor the oozes are rich in calcium carbonate, derived primarily from the bodies of marine organisms, but below 15,000 feet there is hardly any calcium carbonate. Pressure in deep ocean tends to keep carbonate in solution.

Water at the surface of an early hot ocean would be much cooler than water near the bottom, also the pressure would be much less than in deep water, therefore silicates and carbonates would tend to gather at the surface in jelly-like masses, growing in size as the temperature cooled, and forming the nuclei of the continents. The salts that are insoluble in cold water, such as calcium and magnesium carbonate and calcium sulphate, or gypsum, a slightly soluble salt, would tend to be locked up in the continental masses along with the silicates of aluminum, calcium, magnesium, iron, sodium and potassium. Because sodium and potassium are lighter than calcium, magnesium and iron, their silicates would tend to stand high in the embryo lands, being the main silicates of granite (along with aluminum), while the calcium, magnesium and iron would be more abundant in the foundation rock of the continents, the basalt.

The soluble salts of course would tend to stay in solution: the chlorides of sodium and magnesium, and the sulphates of potassium and magnesium, but much of these would be locked in the early jelly-like masses of the embryo continents and remain there when the surface cooled and the oceans and lands were ready for the creation of plants and animals.

The close association of granitic gneiss and limestone can be explained, reasonably, only by an origin such as this: granite did not crystallize from a melt—a molten mass—but crystallized out of a hot, jelly-like watery mass. Also granite

has a very high melting point, above 1,500°C., while far less heat than this decomposes calcium carbonate, making quicklime and freeing carbon dioxide. When granitic material and limestone are side by side in close association it is evident that they formed, not from a molten mass or by precipitation from cold solution, but from the cooling of a hot solution.

This kind of origin explains the limestones of the land masses, stratified and otherwise. They did not come by gradual precipitation from solution during long ages, but by the breaking up of the lands and shallow sea floors of the antediluvian earth. These, probably, were heavily water-charged even at the upper levels (but below sea level) of the antediluvian land masses, and their relocation followed by the uplift of the present lands.

On the Remaking of the Ancient Earth

When an understanding is needed of how the present lands came into being it should be kept in mind that the only known possible agency for material movement of the surface of land or sea floor, past or present, is the hot steam and other gases within the earth; that is to say, volcanic action. The more hot steam there was within the earth's crust in the past, the greater the cataclysm and the greater the power for uplift, and little more need be said about that.

However, when we see in the Himalayas mountains rising more than five miles above sea level, we have to conclude that the disturbance which pushed up those mountains must have extended many miles downward below sea level. How many miles? Who knows? A rough estimate of 30 miles or more would not seem to be out of order.

Some theorizing about the cause of such uplift should be permitted here. A number of years ago some surprising findings about the action of matter under very high pressures were made by Harvard University physicists. A substance frequently changed its form and nature greatly under pressure. Also change in volume did not occur gradually in all cases,

but suddenly and explosively when a critical point was reached.

Consider these findings in connection with the Deluge, which was not an event of brief duration, but a cataclysm which took approximately six months to come to a climax and about as long for a readjustment of the earth's crust. Superheated steam and other gases dissolved in earthy material deep down in the ancient continental masses worked their way out, breaking up the lands and shallow sea floors in the process, forming the gold-bearing and other gravels so common in many places. This, in the nature of the case, would relieve the pressure deep down in the earth, the material there being still highly water-charged, and this would force up the burden of still soft rock above it. Probably much expansion of the deep-seated rock would occur at that time. Hence lands and high mountains could form and still be at a state of isostasy (or approximately so) with other areas where there was little, if any, uplift. That seems reasonable.

To try to explain great mountains of sedimentary rock on the basis of ages-geology is, however, unreasonable. The Alps provide an excellent example of this since they are in Central Europe and rise much higher than any other part of that so-called continent; some are higher than any mountains in the United States. For the Alps to form by ages-geology, an immense quantity of sediment would have to form in a very deep depression in Central Europe late in geologic time while the lands in general were in a state of isostasy. Then after they were down, the land surface would have to rise for three miles or more. That is out of the question.

Or—and this is what is alleged—these sediments would form over a very wide area and be pushed together by the movement of the earth's crust (or a thin layer on the crust) from several directions toward a common point, thus pushing up the mountains. But considering the rigidity of the earth as a whole and the firmness of the crust, this is worse by far than to have the sediments pushed up out of a deep depression. Deluge geology seems to offer the only explanation for

the mountains that reason can uphold. Other great mountains of sedimentary or plutonic rock would have a similar origin—if this hypothesis is valid. The material of purely volcanic mountains has been brought up from deep within the crust by the hot steam of the magma, so sedimentary mountains could be thrust up by the pushing up of part of the earth's crust.

While we are considering the Alps we should consider the impossibility—barring miracle—that the Alps were formed during long ages while the basin of the Mediterranean existed a little to the south, completely surrounded by Europe, Africa and Asia Minor, save for a narrow and shallow opening to the Atlantic. If sediments 40,000 feet thick, or even 5,000 feet thick, are going to accumulate in individual geologic periods from the Cambrian onward, to say nothing of what would happen in Pre-Cambrian eras, any basin existing at the start of geologic history where the Mediterranean now stands would have been filled up long ago. Ages-geology would have us believe that in a small country like Britain 40,000 feet of Cambrian sediments could be laid down, later 40,000 feet of Ordovician sediments and Carboniferous sediments, and great thicknesses of most other supposed geologic periods, while during the whole history of the globe the Mediterranean Sea was not filled by rock wastes from surrounding lands. This is too much to ask.

The Nature of the Early Continents

A logical starting point in trying to determine the cause and nature of the Deluge and the processes—to the extent that they were natural—which made the lands as they were after the Deluge is to try to determine the nature of the antediluvian earth.

By the time the world was well started, enormous quantities of water doubtless remained within the continental masses and under the shallow sea floors, providing only a weak foundation for any lands, so such lands as there were would probably not be elevated much above sea level. Much

of the surface of the continental masses would probably be close to sea level and below sea level. Sure enough, when the sedimentary rocks are examined for their fossils, remains of sea shells and other marine animals are abundant here and there in the continents the world over. Many of the marine fossils are of modern kinds, as are many of the terrestrial fossils, showing that the lands were uplifted not long ago. Such conditions would seem to be impossible on continental masses that had existed for hundreds of millions of years, or even for a few million years, with mountains being pushed up at different times and the depressions being filled from their wastes.

With only low lands and much water surface here and there the globe over, and free water movement from the equator to the poles, no great storms would develop and no extremes of temperature would occur anywhere on earth; the 'winter' nights might be long and plants would go dormant in the far North and South, but the temperature would not drop far because of the warmth of the water, and the long summer days would give a long growing season. In this way mild temperatures would rule over all the earth, as is indicated by the corals of northern seas and the fossils of plants and animals of temperate regions in the Antarctic and in lands of the far North.

For another thing the water within the earth, having a far higher temperature than the surface of the earth (as is evident from the geysers of Yellowstone, Iceland and New Zealand, and warm springs here and there the world over even now), naturally would tend to work its way outward, bringing with it carbonic acid and other gases that would replenish the carbon taken from the air by plants to make the coal, petroleum and the organic carbon of the shales.

The carbon of the coal, petroleum and shales in general must have been taken from the air in the past, and it must have been replenished from within the earth at about the rate that plants took it from the air. Those who study the history of the earth can have their choice in deciding whether it came from within the earth in a few centuries less than 2,000 years,

or through 2,000 to 3,000 million years; only in making their decision they should note that sulphur seems to come from volcanoes and hot springs more abundantly than does carbon, or at least to about the same extent, and if the earth has been operating for millions upon millions of years there would be immeasurably more sulphate in the ocean than there is.

Also, with a presumably more or less uniform production of volcanic gases, including water, from within the earth through the different geologic periods, it would seem incredible that plant carbon (coal) would be produced mainly in the Carboniferous period and later in the Cretaceous period, while nearly all of the petroleum seems to have been formed in the Tertiary Era, when very little coal was formed—by ages-geology. The thing is contrary to reason. It seems to be far more reasonable to decide that the coal vegetation was accumulating in the period from Eden to the Flood by Deluge-geology, and the petroleum carbon accumulating at the same time, than that these were being produced and deposited gradually during long ages.

In the Deluge theory, with a warm, mild climate and much carbon dioxide in the air both plant and animal growth would thrive immensely in antediluvian times. Warm air contains much moisture, which would tend to prevent the escape of heat from the earth's surface, as would carbon dioxide from the air, thus making mild antediluvian climates.

However, as the centuries passed both the water and the carbon dioxide (and other gases) within the earth would be depleted. Then the Flood would come. Enormous quantities of water from deep within the earth's crust would break forth, breaking up the lands and shallow sea floors and forming the enormous quantities of what we call sedimentary rocks, although actually most of these would be formed from material of the antediluvian land masses after being moved around somewhat. It would be laid down with violent movement of water in sheets in many places, and later be uplifted to form our present lands.

Genesis and traditions of the Flood generally have this cataclysm come as a judgment on the antediluvian world,

only Noah and his family being saved. They do not have the Flood break out with sudden violence, but it starts with heavy rains, forty days passing, it would seem, before the Ark was afloat, while months passed before it grounded, and more months passed before the lands were ready for Noah and his companions, human and otherwise, to emerge from the Ark.

The Continental Terrace

This brings us to a critical place in our geology: trying to account for the continental shelf that surrounds the lands, and the continental terrace generally. Ages-geology offers no explanation for this and it cannot do so, particularly in view of the way that the material under the continental shelf and under coastal plains back from the shore are so often composed of recently deposited material. Deluge geology accounts for it, though. The Deluge cataclysm, with violent movements of water here and there would naturally sweep the surface of the ancient land masses flat like the surface of the continental shelf; only the whole surface of the land areas at the height of the Deluge cataclysm would be covered with water and almost flat.

Then lands would rise within the continental masses, but not to the edge of the land masses; the rim around their edge would be the present continental shelf. Its level would be determined mainly by the violence of the waves that had swept over it. The fact that the level where the shelf gives way to the continental slope is as close as it is to 600 feet down must be significant. How would ages-geologists account for the continental shelf and terrace? Also by Deluge geology an agency for the uplift of our present lands is provided by the water deep within the earth and at a high temperature after the Deluge had come to its close. The water near the surface had worked its way to the surface easily in antediluvian times, but when it was largely exhausted, the water deep down in the earth's crust and in mutual solution with earthy material would find difficulty in working its way to the surface. Being held tightly and under high pressure in the silicates and other

minerals many miles down in the earth's crust, it would break forth with explosive violence, to a great extent breaking up the upper part of the continental masses, causing violent movements of the water at and near the surface and causing much stratification of the so-called sediments.

This merely touches a few features of the problem; for a person to think that he could explain how all this came about and how the various geologic formations came into being would be the height of presumption. For all that anyone can say, 'miracle,' or acts of God beyond what would happen through 'natural processes,' may have had much to do with the way the antediluvian world was destroyed and the postdiluvian lands formed.

If the antediluvian world was destroyed in a flood and if Noah and his family were preserved in an Ark—which should be believed if the fact of a Deluge and the repeopling of the earth by a few survivors of the Flood is believed—the thing was surely 'miracle' to a very great extent, no matter how much 'natural processes' operated in it.

This is shown from the fact of an Ark, built by Noah and his associates at the direction of God. Noah would certainly not have built the Ark unless directed to do so; neither would he have known when to stock it with food and when the Flood was to occur. Have a combination of events like that, and the direction of Noah by the Deity becomes as evident as evident can be; also God's dealings with Noah and others in Noah's line, both before and after the Flood. To assert only natural processes for the Flood under those conditions would be absurd. Nevertheless we have seen how what we call natural laws discredit ages-geology and sustain Deluge geology right down the line.

And, if we accept the fact of Noah and the Flood, as evidence demands, simple common sense and the purest wisdom (which are closely related) both demand that we accept the Genesis account of creation, as creation and not 'evolution,' with Adam and Eve superbly endowed man and woman, made in the image of God, but losing their high estate through simple folly and disobedience.

Then too we must believe that they and their early descendants were so highly endowed physically and mentally that the capable men and women of today or of antiquity have and had only a small fraction of the physical and mental endowment of their first parents. Yet even so, when we see the great talents and even genius of a few individuals here and there—mostly talents or genius in two or three limited ways at the best—we must feel that modern man at his best is a poor thing in comparison with our first parents, even after the Fall, or in comparison with their righteous descendants for some generations after the Flood.

Noah and his sons could never have built the Ark unless Noah was, probably, almost as well endowed as Adam. According to Genesis, his life was but little less than that of Adam, even though the postdiluvian world was doubtless a much poorer place to dwell in than the antediluvian world; nor could his descendants have populated the present world if they had not been highly endowed too and for many centuries clean-living and righteous men and women by present standards.

If mankind now had the task of selecting a few families to repopulate this earth, provided its surface was to be made over, but lacking the knowledge of Nature that we now have, the task would be hopeless. Civilized man survives only because of doctors and dentists, miners and artisans of all kinds. Without them he might live in poverty and misery for a while and then perish.

Ancient men however, born either from savages who descended from apes, or from the descendants of Adam and Eve and Noah and his sons, built up great races and civilizations only a few thousand years ago. As scholars and scientists, we must decide whether these came from apes or from fallen men whose first parents were created so highly endowed that they were said to have been made in the image of God.

Note on Isostasy

The principle of Isostasy is one of the most important and

interesting principles of geology. The term means 'equal weights.' The weight of any great area of the earth's crust of some certain size, including water and air over it, is always nearly the same as the weight of any other area of equal size, whether this be mid-ocean, mid-continent, over low plains or in mountainous regions. Where high mountain masses stand the rocks are reasonably believed to be less dense than those underlying ocean floor.

This condition of isostasy does not hold true, however, for certain places of limited area where there are anomalies: the pull of gravitation at part of the surface may be somewhat more or somewhat less than normal.

The relation of isostasy to geologic processes is something like this. Postulate a group of high mountains some time in the past whose rivers flow into a deep inland sea—or shallow sea, as the case might be. Both areas will normally be in a state of isostasy: the weight of the crust in one place balances the weight of the crust in the other.

However, rock weathering and river flow have their effect and in time most of the material of the mountains is laid down on inland sea floor. Unless something gives, the crust where mountains once stood will be much less than normal weight and the crust where inland sea once was will be overweight. But this condition is not supposed to develop. Despite the solidity of the earth's crust it is assumed that—partly because of a heavily water-charged and hence semifluid vitreous layer at the base of the crust—there will be a sufficient flow of material deep down so that the surface with surplus mass will sink until it reaches a state of approximate isostasy, and the denuded area will be pushed up until it is in a condition of approximate isostasy again.

This seems to be sound theory, but it plays hob with the theory of geologic ages. Theorize regarding the area where the Alps stand to see this. Any other great mass of sedimentary mountains would do as well. The Alps are composed of sedimentary rocks that are many thousands of feet thick, yet they stand higher than any other land in Europe.

Presumably then there once was a depression in Central

Europe into which rivers from higher land could lay down their burden of this, that and the other material that was to become the shales, sandstones and limestones of the present Alps. This should make the surface of said depression sink and sink as more and more sediment was laid down upon it. Instead it rises thousands of feet above the general land level of Central Europe. The thing works out in the reverse way from what it should by the principle of isostasy. Yet the principle of isostasy seems to be sound in both fact and theory. The inevitable conclusion from this would seem to be that the earth did not have the kind of history that the ages-geologists assert for it.

CHAPTER FIVE

HUMAN AND GEOLOGIC HISTORY

ONE OF THE FIRMEST BELIEFS OF GEOLOGISTS IS THAT MEN have lived on earth for about a million years but that Man is a late comer to the earth even at that. If the age of the earth be considered a kind of cosmic year, man came into being only about half a minute ago. Nevertheless there are more than a few evidences in pure geology that human history is nothing like this by any means. Particularly it is not the case if the possibility be allowed that the Noachian Deluge rather than slow action for millions of years was responsible for the sedimentary rocks and the fossils which they contain.

Traditions of the Flood are abundant almost the world over, not only among advanced races, but frequently also among savage and so-called primitive peoples. It seems unbelievable that these could exist without a valid foundation, and the only real foundation must be the event itself. Flash floods in mountainous regions surely would not give rise to the numerous traditions of a real flood and a great vessel to save men and animals. Neither would ancient spring floods on wide plains do so. They are far too common and also too easy to escape from by moving to higher ground.

No great deluge was ever possible, except by miracle, up-

on an earth that is constituted as the earth is now. The term *terra firma* is sometimes applied to the land. It, and the earth as a whole, is firm, even though it may be shaken occasionally in places by an earthquake. Never since the lands were covered with vegetation and man appeared could water rise to cover hills and mountains in the way that Genesis records unless there were radical differences in the makeup of the earth before the Flood and after it.

In connection with human history note the radical differences there would be in the world if man evolved from apes, shrews, reptiles, fishes and still lower kinds of animals instead of descending from superbly endowed created ancestors, as Genesis has it.

Evolution and ages-geology would have man come into being something like a million years ago and live in savagery in a manner little different from that of his ape ancestors for thousands upon thousands of years. Also, to the extent that remains of 'primitive man' have been found, real men must have lived many tens of thousands of years ago in places as far from one another as South Africa, the East Indies, Northern China and Western Europe, to say nothing of various other places, if ages-geology be true.

Then, after hundreds of thousands of years, coming from a certain area in southwestern Asia, mankind would suddenly break forth as numerous different and highly endowed races, and their ancestral home would be the place which Genesis gives as the home of the early descendants of Noah. That is contrary to the ages, but just what Deluge geology indicates.

There are some significant features in this connection about the races of early men. They differed from one another to an appreciable extent in appearance and culture, though showing great resemblances in these too, but, strange to say, with hardly any resemblance that can be found in many cases in language or writing. Yet naturally speaking, men who descended from common ancestors would be expected to have languages that were very much alike. If we allow the possibility of creation and a Deluge, the history of mankind as outlined in Genesis should be believed.

Consider the distribution of the races of man in relation to the possible origin of those races in the district north of the Persian Gulf, where according to Genesis Noah and his family lived after the Flood. At the dawn of history, the so-called Aryan peoples occupied the area extending from Northern India to Western Europe and touching the district just named. The Semites (descendants of Shem, one of the sons of Noah) occupied the fertile lands north of the Persian Gulf and much of the land northward and westward to Africa. The lighter-skinned descendants of Ham occupied Northern Africa and most of Western Asia which was not possessed by the descendants of Shem.

Even the black races seem to have divided at about this district, one branch moving westward into Africa and the other going southward and eastward through India into the East Indies and southeastern Asia and thence into Australia and many of the islands of the Pacific.

The superbly endowed Polynesians of the Pacific had their ancestral home in this place. An early home was Java, from which they moved eastward into the Pacific about 2,000 years ago, having the tradition of entering Java from the northwest. That not only suits an origin from the area where the early descendants of Noah are believed to have lived, but it suits a time for the Flood like that figured by Archbishop Ussher a couple of centuries ago.

The Chinese are known to have come from this general area, having migrated eastward from south of the Caspian Sea about 2300 B.C., and other Mongoloid peoples must have been with the ancestors of the Chinese at about that time. This also fits the Deluge system of human history.

Man's Place in the Fossil Record

Both in the general problem of ages versus Deluge geology and in the problem of the antiquity of man, the place of man in the fossil record is of major importance.

As it happens, fossils of the higher animals can be classified in two ways: by the body of an animal or some part of it,

or by its footprint. One is as valid evidence of the former existence of the animal as the other. The thing is noteworthy as far as certain reptiles are concerned, since frequently their footprints are abundant in certain rocks without any of their remains being found in those rocks.

A somewhat similar condition exists with man. What seem to be human footprints and what could be the footprints of no other known animal, living or extinct, are found in many parts of the world, including the United States, with no human remains in those rocks or formations as far as is known. This brings up a question that should be decisive in both human and geologic history if it can be answered aright: Are these really human footprints, or were they made by some other animal? Or are they artificial, made by the art of man, and not true footprints?

The critical feature of the case is that most of these footprints are in rocks that by ages-geology are scores of millions of years old, and which were formed not only before man was supposed to have lived, but before either birds or mammals or most reptiles came into being. If these are true human footprints, ages-geology is a gigantic blunder and the sedimentary rocks and the fossils therein, save those that were made in the last few thousand years, were formed as a result of the Deluge.

No attempt will be made to discuss this problem in detail here; that should be unnecessary. All that should be required is to point out a few things that are well known to geologists, and these can be looked up by any person who has access to a good public library.

Man is believed to be a late comer to the Americas, both because he has been held to have started in the Old World and because all known races of men seem to have started there. Nevertheless for some generations footprints believed in the very nature of the case to be human have been found here and there in America, and strange to say, most of these seem to be in Carboniferous formations or other ancient formations.

In 1938 a number of excellent human footprints (at least human to all appearance) were found in Devonian sandstone near Berea, Kentucky. This caused something of a flurry

among geologists and anthropologists and there was a good deal of comment on this in the science press. The basic facts are given in two issues of *Science News Letter*, one under the date of October 29 and the other December 10, 1938. An excellent photograph of one of the footprints is given in one of these.

The shape is that of a human footprint, and so is the size, though the different prints differ in size, as they do among persons. (Several giant prints have been found in places, such as would be made by men or women of the size of Goliath, the Philistine who was killed by David, as the Old Testament records.) The proportion of the toes to the rest of the foot is as it is with modern men, though the toes are spread instead of being crowded together as shoes crowd together the toes of mankind today.

However, there is a qualification to this: in the average human foot the big toe is far larger than the other toes, but in many of these prints it is but little larger than the others. In other prints the size is normal.

Scientists being unwilling to allow that these footprints could have been made by men and therefore deciding that they must have been made by some other animal, the maker has been called *Phenanthropus mirabilis*, which means, 'marvelously human like.'

Since the maker was a biped, walking like man, and since neither reptile nor amphibian of any age made a footprint like these, and all mammals whose footprints resemble those of man (bears, for example) are quadrupeds, whose footprints go in two pairs, these footprints must have been made by men or angels, or the whole problem of their origin must be held to be beyond solution on the grounds that the ages-theory must be accepted. That would be a crime against science. Once they are allowed to be human the solution is clear: the ages-theory was a gigantic mistake and the Flood was responsible for the face of the earth being as it is; the prints were made in the Flood period.

The possibility—if it can be called that—exists that these are not footprints but were carved by modern men. Some-

what similar carvings are not uncommon, but they can be seen at a glance to be artificial. The Berean footprints were so natural-appearing that they were given very careful study. Here is part of a report of a special investigation as given in the December 10 issue of *Science News Letter*:

"Each member of the party certified and checked these findings and we all agreed that the imprints were made when the sand was soft and wet"; that is, they were made immediately after the sand was laid down and before it could harden into rock.

Nothing more need be said about the antiquity of these and other footprints, but more can be said on the connection of fossil men with the problem of the time of the uplift of the lands and the time that the upper rocks at least were laid down.

The finding of human remains and artifacts in gold-bearing gravels near the top of Table Mountain in Calaveras county, California, about 85 years ago caused a great furor among scholars in America and elsewhere. By standard belief, then, it was impossible that the bones could be human or the artifacts genuine. Yet there they were; George Frederick Wright goes into this in some detail in *Man and the Glacial Age*.

There is no valid denial that the finds were genuine: they were near a mountain top, and the mountains were surely lifted after men had come into being, and the time of its uplift was almost certainly when the mountains behind it, the Sierra Nevada range, were uplifted. The bones and the artifacts were not buried in the gravel after the mountain formed, because they were in gravel and the gravel must have been pretty close to sea level when it was deposited. Calaveras Man must have lived and died before the Sierra was uplifted; he must have perished in the aqueous cataclysm that destroyed the face of the ancient world, whose close was accompanied by the uplift of the present lands. These are plain facts; the question is whether their implications are to be accepted by men or rejected to sustain the good name of science.

Beginnings of Human History

A determination of the approximate time that the nations of antiquity came into being should provide strong evidence for or against a universal deluge and for or against the start of mankind by a real creation such as Genesis records. If human, though unwritten, history runs back for tens of thousands of years, as the theory of evolution and standard beliefs of scholars hold, civilizations of antiquity would have had to start at least eight or ten thousand years ago, spreading from a common center.

Surely this did not happen. Civilization seems to destroy rather than to sustain peoples who achieve it; prosperity is an ephemeral thing, though savagery seems to be even more ruinous than civilization. Also, if the civilizations of antiquity reached back for many thousands of years there should be some record of it.

Instead, the peoples of antiquity seem to have burst into bloom suddenly, highly endowed as races and individuals. Egyptologists write as if the First Empire started many thousands of years ago, but when it comes down to definite facts anything like a real chronology is lacking until the approximate time of the Exodus from Egypt and the invasion of Canaan by Israel—1491 and 1451 B.C. according to Ussher, whose figures are probably only approximate. The accession of David to the throne of Israel was approximately 400 years later, and the known history of Assyria and Babylonia is sketchy and indefinite until later than this.

Compare these dates with the time that such virile and capable races as the Greeks and Romans enter history. The Greeks seem to have been in the childhood of their race at the time of the invasion of Canaan by Israel, since the Trojan War seems to have been fought about halfway between the time of Joshua and David, while the First Olympiad, 776 B.C., was held only about 160 years before the fall of the kingdom of Judah and the beginning of the Babylonian Captivity. Rome was founded a generation after the first Olympiad, in 753 B.C. Such virile races as the Greeks and Romans

never in the world split off from the common stock from which all races came thousands of years before they appeared in history, keeping distinct from other men until then, and with distinct languages. Descent from the sons of Noah, and a splitting of mankind into different races late in time provide the only reasonable explanation for these conditions.

The Scandinavian and Germanic peoples surely are capable and virile peoples too, and note how late they entered history. If they had separated from other races of men six or eight thousand years ago they surely would have been prominent in history thousands of years before they were.

The comparatively brief period that a civilization can continue ought to be noted here. The glory that was Greece lasted for only a few centuries. Then Rome took over, but Rome fell in corruption and inefficiency a few centuries later, through the barbarian invasions. Egypt was magnificent for some centuries, but Nebuchadnezzar, king of Babylon, found it easy prey. So did the Persians a few generations later. Persia and Egypt fell soon before Macedonia; and the Macedonian or Greek governments fell before Rome.

And where are the ancient empires and cities of Babylonia and Assyria and the near East generally? Almost deserts, with people poor, ignorant and incompetent.

Cross from Europe to America. Wonderful civilizations developed here, centuries later than the civilizations of the Old World, but none endured for long. Some had collapsed before the coming of the Spaniards; others were about ready to collapse. Similar conditions existed in southeastern Asia and the East Indies. Ruins of great cities are found there. Their builders could develop great cultures, but after a few centuries of prosperity these fell of their own weight, usually because of a fatal decline of moral standards and corruption and inefficiency in the government.

If perchance there had been great cities and high civilizations thousands of years before the times of Moses, Abraham and the Hebrew commonwealth, decay would have been as rapid as it was with the great civilizations of antiquity: Egypt, Chaldea, Assyria, Media and Persia, and other coun-

tries of Western Asia, with special mention of Phoenicia. The people who founded these civilizations would not have come into being just a few thousand years ago as fresh, virile peoples if nations with high civilizations had been near them for many centuries.

The only way that conditions at the dawn of history can be accounted for is descent from our fallen Edenic ancestors, as Genesis has it, and the later destruction of the antediluvian world; then the repeopling of the face of the earth by the descendants of Noah. It may be absurd to ask intelligent men to come back to this belief, but if geologic and human history demand this belief, and they seem to do so, this is what should be done.

CHAPTER SIX

THE PROBLEM OF STARTING THINGS

ALTHOUGH IT IS NOT ABSOLUTELY NECESSARY TO KNOW HOW the earth and the rest of the solar system came into being in order to get a fair understanding of geologic history, this ought to be known; but it is not. Mathematicians, astronomers and geologists have believed, or at least taught, the classic Nebular Hypothesis, the Planetesimal Hypothesis and the Tidal Theory in turn, but now no reputable scientist who is supposed to know about such things is poor enough to do any of these three theories reverence. No time or space will be wasted here in discussing them.

Still, if to science 'supernatural' is a meaningless word, and if everything that happens or has happened is 'natural,' some naturalistic processes should be found that could account for the solar system. This has not been done. The most favored theory for it now seems to be the contraction of a cold, dark dust cloud in interstellar space; the main part coming together to form the sun and other parts forming the earth and other planets and minor parts of the system. But even this hypothesis is not set forth as sound theory, as were

its predecessors. It is known to have basic weaknesses—which are seldom mentioned.

For it three things are required. It should account, reasonably, for the sun as it is. It should account for the planets, with their composition and their orbits. It should bring the earth into being as a hot body, the material of which was sorted by heat and with enormous quantities of water within the earth at very high temperatures.

It can do none of these things, which is a way of saying that the earth and the rest of the solar system did not come into being, for all that can be seen, by the contraction of a cold, dark dust cloud. Astronomers and geologists have no right therefore to set forth this theory as worthy of respect—except as an effort to find a way that the solar system might have started.

Of the three features just mentioned let us start with the problem of getting a hot earth from a cold dust cloud. The thing seems impossible. Material distant from stars is cold; presumably very little warmer than absolute zero, and that is cold. Cold gas (or liquid) and cold solids seem to be poor material with which to build a hot earth in cold space.

Of course heat would develop from the fall of a meteorite after the earth had reached an appreciable size. It might even vaporize the meteorite, but in cold, dark space the heat so generated would nearly all be radiated away within a brief period, and the chance of another meteorite hitting that point again within centuries would be small. The only way a hot earth could come into being, otherwise than by the decree of the Creator, would be for a great cloud of meteorites to fall upon the embryo earth within a brief period after the earth had established its orbit around the sun. That would be asking too much of coincidence; seemingly material in cold space could not make a hot earth.

There now arises the problem of the development of heat in a sun that came into being by the accumulation of cold matter in cold space. The same difficulty develops. Of course, the larger the sun became, the greater the heat developed by the fall of individual particles upon it; but at the same time

the hotter the surface of the embryo sun, the more rapid the loss of heat into space. For the sun to attain anything like the heat needed to make it a glowing mass, such as it is, an immense amount of material would have to fall within a brief period of time. Again that is asking too much of coincidence.

For another thing, if the Dust Cloud Hypothesis is sound, the material composing the planets, or at least the giant planets, would be much like the material composing the sun. But such material, falling in upon itself to make a sun, would surely not become as hot as the sun is now. The whole theory of the thing is bad.

The Origin of the Solar System

As a whole, the Solar System consists of a sun with a family of planets, all traveling around it in the same direction and in approximately the same plane, all in almost circular orbits and *at very different speeds.*

It is asking too much of coincidence that such a group of planets come into being *naturally*. First, they must have come *as a family* and from very great distances. Yet they travel at very different speeds and they must have come to the sun from the same direction, at different speeds and at different times, the nearest approach of each planet to the sun being much different from that of the others. The nearer the planet to the sun, the faster it travels, and the farther away, the slower it travels. Thus Mercury travels about 60 percent faster than the earth and the earth about five times as fast as Neptune. If all planets approached the sun from a great distance all should have come at about the same speed instead of at such different speeds.

There should be no occasion to deal with the implications of all this, so all that will be said about them now is that the planets, differing from one another as they do in many ways, cannot have come to the sun from afar, nor have been captured by the sun if they did come from afar, nor would they have such circular orbits if they had come from afar and been captured by the sun.

The opinion of this writer is that, comparing the merits of the condensation of a nebula to form the solar system with the merits of some kind of solar cataclysm, the latter has all the better of the case. But, even there, no kind of solar cataclysm that would make a solar system has yet been suggested which merits respect. The rounding out of the orbits of the planets is one seemingly insurmountable difficulty and their varying speeds is another.

Granting a solar cataclysm from which it would seem that a solar system might develop, those masses which traveled the fastest would doubtless go farthest from the sun; as it is, the planets which travel the fastest are those nearest the sun. Astronomers and geologists had better give up the job as hopeless and do the right and proper thing: acknowledge the need of creation to start the sun, the earth and the other planets.

The Age and Heat of the Sun

There are other features about different parts of the solar system that have a bearing on the age and history of the earth and some of these will be discussed now.

This fact should be recognized: the assumption of a great age for the sun is based primarily upon the belief that the earth is billions of years old. If the earth is not old, no evidence is available now regarding the approximate, or probable, age of the sun, except that seemingly it cannot be old. When the earth was assumed to be sixty, or a hundred, or four hundred million years old, the sun of necessity was assumed to be at least that old, for it is beyond reason to suppose that the earth could be an earth without having the sun to provide light and heat. In fact, for many decades the difficulty in accounting for the production of heat and light in the sun for an extended period of time was a major problem in finding sufficient time for the supposed geologic ages.

Then when radioactivity was discovered, a greater possible age for the sun was postulated, and when radioactivity supposedly proved that rocks on earth were 1,800 million

years old or older, at once it was assumed that the sun could be indefinitely old. However, if the rapid increase of saline matter in the ocean proves that the earth is not old; if the nature of volcanism proves the same thing, and if there are other evidences to this effect, as there are, the sun should not be assumed to be older than its ability to produce heat and light justifies—and it seems impossible that the sun could produce heat and light for millions of years except by the will and act of the Creator.

In this connection I want to go back briefly to the radio-activity of uranium and thorium. The 'half-life' of uranium is believed to be about 4,500 million years and the 'half-life' of thorium about 14,000 million years. On this basis a person would naturally assume that a good many thousands of millions of years must have passed since uranium and thorium came into being, since much lead and helium seem to have been formed by their decay. Yet only a few years ago only about 2,000 million years were supposed to have passed since a great cosmic explosion took place to start the different galaxies. Uranium and thorium can hardly be believed older than that, and with their long 'half-lives' little helium and lead should have been formed from their decay by now. (About the only thing proved by this, if it proves anything, is that there is so much in Nature that seems inexplicable that scientists should cease to be dogmatic about theories which have little but fantasy and speculation for their support.)

However there is some direct evidence that the sun is not old. The sun is doing one thing in addition to radiating away energy: it is losing light gases, not necessarily continually, but frequently, and in considerable quantities. A thing like that could not continue indefinitely. This loss is by great solar eruptions, with gases shot out so far that contact is lost with the sun. Then radiant pressure forces that gas outward, 'never to return.' How much of the mass of the sun is lost in this way in a thousand or a million years may never be determined, but it must be great. No sun could keep that up long, the way geologists count time.

The Nature of the Giant Planets

I bring this up for two reasons: one being as evidence against an indefinitely great age for the sun, and the other to suggest a cause for the icy, liquid and gaseous coverings of the giant planets.

These coverings are composed, in part, of hydrogen and helium and perhaps liquid oxygen and nitrogen too, but there is also water on, or in them, as ice. There is carbon dioxide as an ice, and ammonia (NH_4OH) and methane (CH_4). There may be some hydrogen sulphide and other gases. Presumably these materials came from the sun, not from outer space, as part of a dust cloud. At least much gas is shot out from the sun and lost to it; seemingly it accumulates on these planets.

While these gases are near the sun they remain gases. Most of them will remain gases until they are well beyond the distance of Mars from the sun. However, after they approach the distance of Jupiter from the sun, their temperature becomes so low that some of them can condense into droplets, in which state the pull sunward of gravitation is greater than light pressure, and the movement outward will cease. Also to the extent that the gas tends to gather together into clouds, gravity will tend to overcome light pressure and the movement away from the sun will cease. The pull of the planets will tend to pull matter expelled from the sun into the plane in which the planets travel and it will fall into these planets.

The earth and Mars are too small to accumulate more than a trace of gas from the sun; also they are too close to the sun, but the cold is so intense at the distance of Jupiter and Jupiter is so large that the gases will be attracted to it. This may be the reason that Jupiter is the giant of the planets.

But much gas gets beyond Jupiter, and much of that can be taken up by Saturn, also a giant, and the planet with the smallest density; hence Saturn is the next largest planet. But by the time Saturn is reached seemingly most of the gas is taken up except methane. Nearly all of the water, carbon dioxide and ammonia expelled from the sun are taken up by

the time they reach the distance of Jupiter and Saturn, and most of the free hydrogen, nitrogen and helium too, and much methane too. Methane seems to be the covering of Saturn, Uranus and Neptune, the latter two having a much higher density than Jupiter and Saturn. Presumably, too, their stony and nickel-iron cores are larger in proportion to their icy coverings than are the cores of Jupiter and Saturn.

One of the most significant features of all this is the fact that Pluto, the outermost planet, seems to have no icy covering at all. It seems to be a small, dense planet about the size of the earth, with small albedo (reflecting power). But if it had any icy covering, its reflecting power should be large, not small; hence we conclude it has no such covering. And here is the critical point of it all: if the planets originated in outer space, from a dark, cold dust cloud, Pluto should have coverings like those of the giant planets—and Neptune and Uranus should have coverings like those of Jupiter and Saturn, and be of comparable composition and density.

The reasonable conclusion of it all seems to be this: the Dust Cloud Hypothesis for the origin of the solar system should be cast aside as wrong; the covering of the giant planets must have come from the sun, and the loss of gas from the sun at least indicates that there is a decided limit to the possible age of the sun. Another angle to this will be discussed later too.

The Atmosphere of the Earth

From the coverings of the giant planets we can pass, reasonably, to the atmosphere of the earth, with emphasis on its helium content as proof that the earth is not old. Helium is being produced continually by the disintegration of uranium and thorium. Great quantities of helium also issue from certain mineral springs, and presumably there were such springs through most of geologic time. If the earth were really old the amount of helium in the atmosphere should be much greater than it is, unless it escapes into space.

This has been discussed so much that I need not give

figures or cite authorities, except one. Harold Jeffreys, noted British physicist, in an early edition of *The Earth* spoke about the small amount of helium in the atmosphere considering the amount of rock that presumably had been weathered in the past, and said, "This is an impossibly small amount." Admittedly this is true unless helium (also hydrogen) escapes into space.

Except for the problem of the age of the earth this alleged escape of hydrogen from the atmosphere is immeasurably more important to the earth than that of helium, since the breaking up of water into hydrogen and oxygen, and the escape of hydrogen into space is supposed to be the way free oxygen developed on the early earth, and the process is believed to continue now. This is an intriguing problem, but I will not discuss it further here.

The trouble with the theory of the escape of molecules of gas from the outer atmosphere is that it does not work. Light pressure from the sun would force back into the atmosphere any molecules that tended to fly out toward the sun during the day, and that is the way they would have to go in order to escape from the atmosphere. On the other hand, as soon as twilight came, followed by darkness, the temperature of the upper air would fall so greatly that there would be no tendency to fly outward; at least the force of gravity would hold all molecules back within the atmosphere.

The only thing that could make a molecule of hydrogen or helium fly out from the upper air would be for the upper air to have a high temperature. This happens only during the day, while light pressure from the sun tends to force any atoms moving outward back into the atmosphere, just as it forces gas (from comets that approach the sun directly) away from the sun as tails of the comets. Tails develop in comets only when they are near enough to the sun to be heated, the light pressure also being strong.

To the extent that hydrogen and helium do not escape from the outer atmosphere two things are indicated, both important in their way. The failure of helium to escape shows that the earth is not old. The failure of hydrogen to escape,

combined with the fact that only the earth has much free oxygen in its atmosphere (with the partial exception of Mars, which has only a trace of an atmosphere) shows that—for all that what we call natural law can show—only the decree of the Creator could give the early earth an atmosphere rich in free oxygen and thus make life as we know it possible.

Comets Prove That the Solar System Is Not Old

This chapter is dealing more with astronomy than with geology, except for the way that a recent origin of the solar system shows that the earth is not old enough for the geologic ages to have occurred. One feature of astronomy seems to show that the solar system is of very recent origin. That is the rapidity with which comets are wearing away or being broken up, or disappearing.

How comets came into being no one knows; explanations for their origin explain nothing. Fletcher Watson in *Between the Planets*, one of the Harvard Observatory books on astronomy, said that they seemed to have started when the solar system started, but that explained nothing because no one knew how the solar system began.

At least these facts exist: Periodic comets which are close enough to the sun to develop tails, lose material each time they approach the sun; the material of the tails is driven from them; each trip they make they become smaller, and a thing like that must come to an end in no great length of time. Large periodic comets like Halley's, whose approaches are noted in history, are much smaller than they once were.

Several other comets with briefer periods have disintegrated since the invention of the telescope and since systematic observation of the heavens began. Their debris is the source of certain meteoric showers.

Other comets have had their orbits changed by coming near to Jupiter, so that they no longer approach the sun and they no longer can be observed. Comets are either lessening in size, being disintegrated, or going out of the picture. No new visible comets are entering the picture, although once in

a long time a comet appears which seems to come from outer space and to go out again. The rate of decrease of comets in size, number and visibility seems to limit the amount of time they have been a part of the solar system to a comparatively few thousand years. Taken by itself this might not seem too significant, but taken along with other evidence against a great age of the earth it is important.

The Production of Heat in the Sun

As was said earlier the problem of producing heat in the sun for a long period of time seems difficult or impossible to solve. Various means have been suggested, such as the fall of meteoric material into the sun, compression and radio-activity. All have failed. The most promising theory a few years ago seemed to be the burning of hydrogen into helium, with carbon and nitrogen acting as agents for this. But this was good in theory only if hydrogen was by far the most abundant element: too much dilution with other elements would slow down the process too far or prevent it entirely. The general view now is that very little of the sun's heat develops in this way, so the theory had to be discarded.

Here is where the general composition of the planets and the icy covering of the major planets are particularly important. There is only the merest trace of hydrogen in the earth, as compared with the amount of other elements. The same condition exists with Mercury, Venus, the moon, Mars, Pluto and the stony and nickel-iron cores of the major planets.

Considering only the water of the earth and the water, carbon dioxide, ammonia and methane of the major planets, hydrogen seems to be outweighed by carbon and oxygen and possibly nitrogen—there is cyanogen (CN) on Jupiter, and probably on Saturn too. If these materials came from outer space along with the iron and stony material of sun and planets, and the sun had that general composition, which seems probable, the hydrogen of the sun would be far too little in amount to produce the heat of the sun.

If we do not know how the sun came into being, unless

by the fiat of a Creator, we do not know its composition, except in a general way, but we know that hydrogen is not abundant. If it were, most of it would be not far from the surface; at least much would be there, and, being the lightest gas, far more of it would be erupted into space than the oxygen, nitrogen and carbon of water, ammonia and methane, yet the contrary is the case.

We simply do not know what makes the sun produce so much heat, and speculation with only a slight foundation is a poor basis for dogmas in science. Practically all the evidence that we do have, points to the recent origin of the earth, and the earth and the sun probably started together. But even if the sun happened to be older than the earth, that would not affect the main thesis of this discussion: that the earth is not old enough for the geologic ages and that it was created and not evolved into being.

CHAPTER SEVEN

MISCELLANEOUS OBSERVATIONS

The Problem of Ice Ages

FOR SEVERAL REASONS THE PROBLEM OF ICE AGE OR NO ICE Age preceding the period in which we live is one of the most important problems connected with the history of the earth. Admittedly nearly all of our present lands were uplifted not long ago, as geologists figure time. Great quantities of the sedimentary rocks in them are Tertiary, or from the Age of Mammals, as ages-geology has it. In places there are great quantities of Pleistocene or Ice Age sediments, in mountains, valleys and under the continental shelf itself, where glacial action would never deposit them.

If the supposed Ice Age occurred, the lands were uplifted about a million years or more ago, but if there was no ice age, they must have been uplifted only a few thousand years ago after a great remaking of the lands, and that means deluge action. Under these conditions the issue between ages and Deluge can be decided in large part by the strength or weakness of the Ice Age theory, so let us get to that problem.

To begin with, no explanation whatever exists for such

differences as there would be between present temperatures and climates and those of an ice age. Climate is determined by several factors, the most important, allowing for the change of seasons, being the distribution and elevation of the lands, in relation to the ocean. Theoretically a great change in the amount of heat coming to the earth from the sun might cause radical changes in the climate of different parts of the earth, but the sun being as it is in size and composition, no material change in light and heat from the sun in the past few thousand or million years can be postulated—nor is it. The matter of ice age or no ice age has to be figured on the basis of the lands being about as they now are and the heat from the sun being as it now is. On this basis there was no ice age.

For one thing, permanent ice that endures from one year's end to another exists upon the earth under very restricted conditions. Ignoring a few ice caves and a few sheltered places in high mountains where there is permanent ice, real glaciers (with moving ice) or ice caps are found only in moist, cold locations or at high elevations, and there they may be located almost under the equator as well as in temperate or polar regions. Both in Africa and South America great glaciers exist not far from the equator and there their existence seems to be due about as much to the moisture that comes to them from luxuriant tropical forests as to their elevation. On high mountains in temperate regions or in the Far North where the precipitation is small glaciers are a rarity, though small patches of dead ice may endure in places for years.

Except near the South Pole true glaciers on mountain tops occur only where the weather is almost continually cold and precipitation heavy. Even on the Antarctic continent little snow falls and the great ice cap continues because there is little evaporation and little melting.

The only other true ice cap on earth is that upon Greenland where the precipitation is heavy and the elevation great. The average elevation of Eurasia is but little more than 3,000 feet; that of the Antarctic continent (counting from the surface of the ice) is about 6,000 feet, but the surface of the ice cap covering Greenland is more than 7,000 feet above sea

level. Even there during the short summer the melting of ice in southern Greenland is great. The surface of the ice cap is almost flat, and great, shallow rivers flow over the surface toward the edge of the ice, falling into fissures before they reach the edge and flowing out under the ice and over the rock surface to the sea.

With such great melting thousands of feet above sea level, far to the north, it is the height of absurdity to suppose that just a few thousands of years ago and for most of a million years before that, great ice sheets covered nearly all of Canada and extended far down into the United States, both in the Atlantic states and inward to Nebraska and little above sea level. And similar conditions are postulated in Northern and Central Europe, including Great Britain. The thing is out of the question.

More than this, the glacial theory postulates the existence of extensive sheets of ice across great stretches of salt water like the Gulf of St. Lawrence and the Irish Sea, a thing that is contrary to reason.

The purpose of it all is to explain the masses of rounded rocks and 'glacial till' and other such phenomena that are found here and there where ice sheets could never form except by miracle. Such deposits would not form by 'uniformity' —'the present is the key to the past' theory of geology—so the glacial hypothesis seems to provide the only hope of ages-geology: but by Deluge geology these phenomena came by the watery disturbance incidental to the uplift of the lands from below sea level near the end of the Deluge period.

There should be no need to discuss other phases of the subject which of themselves should be conclusive, but one little point does seem to merit notice. By the glacial theory ice covered the Rocky Mountain country from Utah northward for about a million years. Much water would flow southward from its edge into ancient Lake Bonneville, of which the Salt Lake of Utah is a small remnant. During this time the fresh water from melting ice would flow outward and downward to the ocean, carrying off any sea water that might have been there to begin with, and when the ice sheet passed

away and present-day climates started to develop, there would be but little salt left to form the highly saline Salt Lake and the salt beds surrounding it.

The lake and the salt beds on its floor therefore testify against the glacial theory and for the apparently recent uplift of the lands there, and for the uplift of much sea water when the land was uplifted.

The Making of the Grand Canyon

The merits of a theory can usually be judged by applying it to some specific problem, so let us now see which fares the better in the making of the Grand Canyon: Deluge or ages geology.

According to ages-geology the rocks through which the Colorado River flows at the Canyon were laid down about 300 million years and more ago; then they were uplifted slowly and the river gradually cut its way through them. By Deluge geology all these lands were formed after the Deluge cataclysm; they were uplifted during the closing months of the Deluge period and evidently great quantities of sea water were uplifted at the same time—the salt of the Great Salt Lake in Utah evidently came into being in this way—and as the uplift occurred the water that was uplifted with the land drained into the Colorado River and its tributaries from the east, north and west, making an immense flow over poorly consolidated rock at the start. This would make a very different kind of river bed than would a river running normally for thousands and millions of years. In fact, considering the astonishing amount of uplift and sedimentation that is supposed to have taken place in the Rocky Mountain region of North America since the Mesozoic Era began, it would be astounding if the surface rocks at the side of the Grand Canyon could be as they now are, or the Colorado River could be running there as it now is.

But coming back to the kind of a canyon the Colorado River might cut by ages-geology and by Deluge geology, a decision on how the Canyon came into being is not difficult

to reach. A river tends to cut its bed straight down; the walls are as perpendicular as the strength of the rock will allow, and in all of this Great Basin country where the stratified rocks seem to have been uplifted almost straight up and without great distortion, the gorges are narrow, deep and with straight walls. The principle is plain, that a rapidly flowing river which deepens its bed will cut almost straight down with a narrow cut. A wide bed is made by a river only where the fall is slight and where large amounts of water are moved. If the fall is sufficient for rapid flow much sediment will be carried and also the bed will be deepened faster than if there is little suspended matter.

The Grand Canyon at its grandest is far and away too wide for a large part of its depth to have been formed by normal river flow. That is plain from a view of it, or from a good picture of it. In the Grand Canyon National Park it varies from 4 to 18 miles in width and it is more than a mile deep. An enormous amount of water would be needed to make that wide a bed. Instead of having almost perpendicular walls such as a river would cut by normal flow, it has such walls only in the gorge proper, which is narrow, while the upper part of the Canyon is wide and its slopes sprinkled with hills, many of them flat topped. The nearer the gorge the hills stand, the lower their tops. Each of these tops appears to have been part of the bed of a wide, shallow river some time in the past. The slopes of these hills as they extended to the edge of the gorge seem to have been part of a river bed in the past until such a time as the flow of water cut a course in the bottom of a wide bed which could hold all the stream flow. Only then did a real gorge begin to form. And only an enormous flow of water such as might come from the uplifting of these lands from below sea level could cut such a wide bed as that made by the river in its early history.

Two or three features of the case call for notice here. First is the great number of these hills and their ruggedness. They once were islands in a wide stream. There can be no question about this. But we do not find permanent islands in rivers like these, or in sediments like these. Visualize a wide river

like this early in its history and in sedimentary rocks like these. It would not take much river flow to wash these hills away: they must have formed during a fairly rapid uplift of the lands, the deepening of the river bed developing rapidly so that the water fell away from them in a brief period of time, gathering quickly toward the center, where it could start making a true gorge.

The way the sides of the Canyon are cut by rugged gulches is another significant feature. Those gulches were not cut by small streams flowing in from the side for tens of thousands and for millions of years. If they were, they would be small, narrow and with perpendicular walls. The banks of a river too are normally smooth, save where small streams enter it and the Canyon would have that kind of sides.

Its width in the upper portion, the irregular sides, the hills on the upper slopes and the evidence of a great width of stream in its early days show something fundamentally different from what would develop from long-continued and normal river flow. Uplift from below sea level in the not too distant past and the flow downward to the sea from the sea water that was uplifted with the land must have cut the Grand Canyon.

Sills, Batholiths and Dikes

Among minor geologic phenonema sills are one of the most surprising and also one where the question of origin in earth-wide aqueous cataclysm or during a series of ages can be answered clearly.

They are masses of plutonic rock that are sandwiched between masses of sedimentary rock and, according to ages-theory, intruded between them. Some of them may not be resting on sediments, but at least sediments rest upon them, and the two kinds of rock came together when the plutonic rock was so hot that it baked the sedimentary material that is in contact with it.

According to the old earth and ages-theory the material of the sill welled up from deep in the earth's crust and spread

out in a great sheet without reaching the surface, and forced itself into the sediments. According to the Deluge theory the hot and evidently semifluid rock rose to the surface while the Deluge cataclysm was at its height and overflowed a mass of newly deposited 'sediment' (perhaps while this was still covered with water, and perhaps while it was exposed to the air); then a mass of other so-called sedimentary material was swept over the top of the sill-to-be while it was still hot, its lower surface being metamorphosed as a result.

It was one or the other of these two kinds of origin, unless some ingenious individual can suggest a third possibility, and no one seems to have tried to do that yet. And if anyone says that this aqueous cataclysm theory for the origin of sills, batholiths and dikes is too absurd to merit respect, the fact that the base of overlying sediment upon a sill was metamorphosed by heat is there to demand a better explanation if this will not do.

Objections to the intrusion theory are serious and to all indications insurmountable. Let a man walk over some lands, say an area like that bordering the Grand Canyon, where sedimentary rocks in great sheets make up the upper few thousand feet of the land. Decide how long he would stay in the immediate neighborhood if he knew that in a few minutes or a few hours an enormous quantity of hot, semifluid basalt was going to rise up from far down in the earth's crust, almost but not quite reaching the surface. He would waste no time getting away, but there should be no danger if sills came into being in this way.

The very nature of rock shows that a great (or small) quantity of volcanic material would not rise almost to the surface without reaching there. At least it certainly would not mushroom out when close to the surface and force its way into solid rock in a great sheet instead of coming to the surface and then spreading out. The uplift of the molten mass would uplift the rock near the surface, causing fissures through which the molten material could reach the surface. And if the molten rock itself would not do this, the gases of

volcanism which cause violent volcanic explosions, would do so.

Sills could not form in the way the ages-theory calls for. The only reasonable explanation for them is the breakup of the earth's crust (where the lands stand) in a great aqueous cataclysm, during which the so-called sediments were laid down, with hot, pasty basalt rising from deep in the crust and spreading over them, and then new masses of 'sediment' being spread over the hot basalt.

The most famous sill of the Old World is probably the Great Whin Sill of northeastern England, extending from the North Sea far inland. It intrudes what are called Carboniferous sediments, by present theory supposed to be 200,000,000 years old, or older.

In the United States the Palisades along the Jersey side of the Hudson River across from New York City are part of a great Triassic sill, presumably a few million years younger than the Whin Sill. But, considering the rapidity with which land areas are weathering away and the many millions of years which are supposed to have passed since each of these sills formed, any intelligent man can ask himself whether these sills formed tens of millions and more years ago, or only a few thousand years ago.

Their nature suggests Deluge cataclysm as conclusively as could be, and only one such cataclysm could be all that could occur upon an earth which operates naturally. Then all the sills, all the batholiths, and all the dikes that cut the upper rocks, must have been formed at the same time; the time that the lands were made over at the time of Noah, a few thousand years ago.

The Making of Coal Beds

If the old earth and ages-theory of earth history are to be considered good science, different kinds of geologic phenonema should be explained by it reasonably, and of these phenomena coal beds are among the most important and the

hardest to explain reasonably. So let us see how ages-geology and Deluge geology compare in trying to account for them.

In the first place, in areas where there are great accumulations of coal, the coal usually is present in a series of few to many beds, separated from one another by thin or thick layers of rock. Before the uplift of the lands where the coal is found both the coal vegetation and the rock separating the different beds from one another were resting flatly one on the other, the whole making a very thick mass.

Thus Arthur Holmes in *The Age of the Earth* has the Carboniferous rocks of both Britain and the U.S.A. 40,000 feet thick and the Cretaceous formations of the Rocky Mountain region of the U.S.A., which contains a great quantity of coal, 64,000 feet thick. It would be patently impossible, unless by miracle, for such thickness of rock to be laid down within the continental mass, or even on ocean floor (where coal would not form). It seems almost as difficult to explain them by Deluge geology unless the Deluge was truly an 'act of God' and therefore a miracle.

However, let us try to figure how in theory a coal bed might form according to ages-geology, and then another and another over it, until a series had formed, as in the leading coal-bearing regions of the world. Coal must have come by an accumulation of vegetation, either growing in the place where it is now found or carried there by water; only the latter implies flood action and not the action of common processes. Thus it favors the Deluge theory, and most geologists agree that much coal vegetation came into place by drift, not by growing in the place where the coal now is. Our analysis to this point therefore seems to leave ages-geology with two strikes on it when it comes to bat, while Deluge geology is at least able to get the bat squarely on the ball.

For ages-geology to account for coal reasonably the assumption should be made that a mass of coal vegetation grew and accumulated to a great thickness over an extensive, flat area in a place where rock wastes could later wash upon it to cover it. Nowhere on earth does there seem to be such a place now; if there were, common sense indicates that if it

sank below sea level, wave action should quickly dissipate the vegetation and sediment would not cover it and preserve it to become coal.

Suppose nevertheless that this happened: the problem then develops of getting the surface where another great mass of vegetation will grow upon it or be washed upon it by a flood; and when this had gathered, another thick layer of sediment would have to accumulate upon it slowly to pack it and preserve it so that it would become coal in time; and then the process would be repeated time after time for each bed of the series. The theory of the thing is absurd, and Deluge action seems to be the only alternative.

What would happen on this basis would seem to be something like this. On an ideal, created earth, vegetation would flourish for something short of two millenniums, accumulating in great quantities in certain large areas somewhat as it now accumulates in the moist, warm portions of southeastern Asia. Then the Flood would come, starting gradually and taking several weeks to reach a climax. At the climax the crust under ancient lands and shallow sea floors would be broken up to a great depth and violent movements of the water would move both the earthy matter and the vegetation here and there; the soggy organic matter would ride higher in the water than the 'sediments.'

After a great mass of vegetation had been laid down on an exposed surface, a great rush of water upon it would cover this with sediment, and when the water subsided a great mass of vegetation would be left upon it, to be covered in its turn until all the beds were formed. Then, toward the end of the Deluge period the lands would be uplifted with more or less tilting and other distortion of the strata.

If men sat down in their studies and tried to figure out a hypothetical history for a world, they surely would not figure out this kind of a history; but the situation is that we have the world that we have and the coal beds that we have, and the oil fields, and we must take them by faith without caring how they came to be as they are, or work out the best explanation for them that we can. This explanation is offered

in behalf of Deluge geology. One great aqueous cataclysm is postulated.

Geologists who prefer ages to Deluge presumably must have aqueous catastrophe, or flood action, to form many coal beds, and when beds are in a series as they are so frequently, that would mean a series of floods, not one of which could form a single coal bed. Much less then would there be a great series of floods for each great coal-bearing area, and these sometimes formed at different periods of earth history.

4,000 Years Ago

In this question of ages versus Deluge the date when the Deluge occurred is of comparatively little importance as far as geology is concerned, but it is decidedly important in human history, particularly since the Carbon 14 method of dating particles of organic matter and of human history has men on earth for many thousands of years.

The subject will be discussed only briefly here in cases where 4,000 years ago seemed to be an important period on parts of the Pacific Coast. That period is mentioned several times, always, I assume, as a round number, an approximation; but it evidently is an approximation, and that is all that could be asked or expected.

The Sierra range of California was supposed to be highly glaciated many thousands of years ago. A number of glaciers still exist in protected places in the high Sierras of Tulare County and adjoining areas. One would think that if all the high mountains of the area were heavily glaciated many thousands of years ago the present glaciers would be remnants of them. Yet here is what F. E. Matthes, chairman of a committee on glaciers of the U.S. Geological Survey, wrote in a report for 1941-1942 on the supposed age of glaciers in the California Sierra.

He accepts the supposed early, heavy glaciation, says that these ancient glaciers disappeared for thousands of years, then: "A new generation of ice bodies . . . came into being during the 'little ice age' of the last 4,000 years."

Note here that if Deluge geology is good science, this is approximately the time that the mountains would have been uplifted. (Even according to Ussher the uplift would be a couple of centuries earlier than this at the least, but as we have just said, '4,000 years ago' is being taken only as an approximation.) Would there be an extensive, severe ice age for most of a million years, then a long period with no glaciation in these mountains, and then the development of a lot of small glaciers? Not so; 4,000 years ago, plus, was the time that these mountains were uplifted, including the making of Table Mountain in Calaveras County to the northwest where the remains of Calaveras Man were found.

Our next reference is from the *Scientific American* for May, 1949, and deals with the country east of the Sierras: "In the western Nevada of the Pleistocene times there was a large body of water, pluvial Lake Lahontan. But geologists show that Pyramid Lake is too fresh to have existed in its present basin longer than about 4,000 years."

The only comment required for this would seem to be that according to ages-geology and the glacial theory all these lands were uplifted about a million years ago, and a million years of drainage into the Lake Lahontan area would result in a saline rather than a fresh-water lake. In fact, if the uplift had been ten thousand years ago, the salts in Pyramid Lake would be more than twice as abundant as they are.

Go southward and westward into the Mojave Desert south of Death Valley and visit Searles Lake. Instead of being a true lake this is a mass of salt covering 10 or 12 square miles, with some brine mixed with the salt. According to the U.S. Geological Survey Water Supply Paper 578, "The Mojave Desert Region of California," there was once a lake here covering an area of about 285 square miles and about 650 feet deep in places. When it dried, it left rich salt deposits which are being worked. According to a writer in the *Saturday Evening Post* of March 5, 1949, this lake started to dry up about 4,000 years ago. There's that date again.

This date springs up here and there in other connections. The *Scientific Monthly* of November, 1953, has an article on

"Archaeological Occurrences of Pronghorn Antelope, Bison, and Horse in the Columbia Plateau." Toward the end of the article the author mentions "evidence of a cool, climatic pulsation beginning about 4,000 years ago, [there it is again] and possibly tapering off at about the present time."

What are scholars going to do about things like these, postulating the existence of present lands for tens and hundreds of thousands of years? If a comprehensive study of the matter was to be made, trying to figure the age of the deltas of the Nile and Mississippi, and so on, much more data to sustain the recent uplift of the lands could be obtained; but as it is the significance of these references where each author uses the date of (about) 4,000 years ago as a starting time for a climatic cycle, must be great.

While we are on the subject another reference to America's animal population of only a few centuries ago may be offered. Every well-read person must know that North America had a large elephant population some time in the past. Mastodon and true elephant fossils are often found, some in connection with human weapons or remains, and many scholars have concluded that elephants were anything but uncommon here not many centuries ago. But what if they were here very recently, since the discovery of America by Columbus? That would at least suggest a rather recent remaking of our lands.

The *National Geographic Magazine* for June, 1953, tells of a David Ingrim who, with two companions, in 1598 traveled overland from near Tampico, Mexico, to New Brunswick, where he was found by a French trader. Some years later he wrote an account of his trip, and in it he wrote of seeing animals "twise as big as an Horse . . . (with) two teeth or hornes of a foote long growing straight foorth by their nosethrilles"—evidently elephants, if he was telling the truth—and the account says that historians accept as fact the main elements of his narrative, though they question this statement. Why should they do so, when mastodons and other elephants lived here once? The thing is mentioned for its general interest and for the suggestion it gives that this land was very different not very long ago from what it is now.

The Problem of Carbon 14 Dating

The problem of Carbon 14 dating to determine the age of various organic materials enters the picture here in an important way, since supposedly pieces of ancient wood and other organic material show ages by this method thousands of years older than Ussher's date for the Flood or than the apparent time for the uplift of present lands. The subject calls for investigation.

In principle the method of determining the age of organic material by Carbon 14 dating is simple, provided the method used is correct, but that is the critical feature of the case. Carbon 14 is being formed in the upper atmosphere continually, though at irregular rates, by the entrance of cosmic rays into the atmosphere. Particles from them strike atoms of nitrogen, changing them into carbon with an atomic weight of 14, rather than 12, which is the weight of common carbon atoms. Some thousands of years later each Carbon 14 atom gives off radioactive energy and changes into Carbon 12.

The critical question in this as far as determining the age of a piece of wood or other organic material containing Carbon 14 is this: How long does an atom of Carbon 14 endure; what determines its life span? Does each atom have the same life expectancy as all other atoms, subject to the effect of environment; or would some be naturally longer lived than others? This writer thinks it probable there may be appreciable natural differences between different C 14 atoms at the start, but the thing is not particularly important.

Pure logic and observation regarding the life expectancy of other things which pass away would seem to call for the conclusion that under average or normal conditions each C 14 atom would break down into energy and a C 12 atom when it had reached the natural limits of its age. This is to say, barring accident and the effect of environment, the individual C 14 atom would break down into C 12 and energy when it reached its normal age limit. By pure theory, then, age would seem to be the major factor in determining the life span of an individual C 14 atom. In a piece of wood or other organic

substance the oldest atoms would naturally be expected to perish before the younger atoms. If not this, what?

The most probable answer, and the only alternative answer with any merit, would seem to be environment, or circumstances; temperature, concentration with other radioactive atoms, or with different materials, and so on. Outside of this, fate, or pure chance, would seem to be the only thing left, but as a matter of science that seems out of the question: the issue seems to be between age and circumstances or environment.

But physicists rule out concentration and other circumstances and age and say that number is the factor which counts. For instance in a piece of wood, cloth or other mass of organic material there will be a great number of Carbon 14 atoms. Supposedly each year one atom in each 5,600 (round number) atoms will disintegrate and change into Carbon 12. At that rate a natural guess would be that in 5,600 years all the C 14 atoms would be changed to C 12 atoms and there would be no carbon radioactivity left—unless age or other factors speeded up or retarded the disintegration.

But this is not the way Carbon 14 ages are figured. Postulate a piece of wood cut from a living tree and figure its life expectancy as far as radioactivity is concerned. In the first place the age of the C 14 atoms it contains will vary, presumably, from atoms only a few days or weeks or months old, to atoms on the verge of disintegrating from sheer age—to the extent that age will determine when an atom gives off its radioactivity. One atom in 5,600 disintegrates in a year. Five thousand six hundred years pass and, *the way physicists figure it,* half of the radioactive atoms will still remain in the wood; all of them 5,600 years older than they were at the start. Another 5,600 years pass, but only a quarter of the original C 14 atoms decay; the others still remaining and with as good a life expectancy as the average atom in the fresh wood, although they are 11,000-plus years older than they were when they were taken from the living tree. Another 5,600 years pass . . . and so it continues; age is not supposed to matter.

Perhaps so, but if so, age and circumstances, which are

the two things which determine the life span of everything that lives and dies, have to be ruled out. The thing surely seems to be terribly bad science. The whole system of figuring seems to be based upon the 'half-life' principle, which may or may not have more or less of a valid basis with uranium and thorium, though physicists know nothing about how those elements came into being nor how the different atoms in uranium and thorium minerals may differ in age from one another; but that would not make it true with Carbon 14.

What seems to be needed is a different method of figuring the age of organic material by radioactivity. To the extent that age is a real factor in the time that an atom of C 14 disintegrates, a different basis of figuring age should be worked out. The present system might serve fairly well for ages of several centuries and even up to a thousand or 1,500 years, but be completely misleading when only a few radioactive atoms were left, and those very old. There are some serious inconsistencies in the findings of age in pollen, in shells and some other substances. Until the whole subject is reviewed with full credit to the seemingly basic weaknesses of the 'half-life' theory of Carbon 14 not much value should be given to the supposed findings of ancient pieces of organic material.

The condition with Carbon 14 dating resembles that with radioactivity dating of rocks by the lead or helium content of those rocks; there are serious flaws in the method and the results are contradicted by the numerous evidences that the earth is not old and that the different formations did not come through a series of geologic ages. Evidences that the face of the earth was made over only a few thousand years ago discredit the supposed great ages of a few supposedly very old pieces of wood and other ancient organic material.

The Making of Metamorphic Rocks

A person who is not a geologist but who observes how rocks weather and what becomes of their wastes should be able to decide how a rock came into being from its composition.

On this basis what are called metamorphic rocks, in most

cases at least, had their start deep in the earth's crust, under high temperatures and in a semifluid condition because of their high water-content, and then were forced to the surface. They are not and never were 'sediments,' that is to say, formed by the decomposition of other rocks. Their composition as reported by Clarke in *The Data of Geochemistry* shows this conclusively.

In the numerous analyses of different kinds of metamorphic rocks that Clarke lists, the composition varies greatly, as a matter of course. Let us take two extreme cases as an example of this. A magnetite schist from the Mesabi Range, Minnesota, had a silica content of only 12.35%, with 58.68% Fe_2O_3 and 21.34% FeO. A quartz schist from Vermont had a silica content of 90.91%, with 4.18% Al_2O_3; 1.27% FeO and less than 1% of everything else listed.

Getting down to one of the most basic principles of this whole proposition, any rock formation of great size that came from the accumulation of sediment from earlier rocks should be hardened sand, mud or silt, the material of which came from a good-sized watershed and from rocks of all kinds—unless the watershed was nearly all granite, and in that case what would accumulate would be mainly silica and alumina. There would not be a great variation between different sediments, as there is between different metamorphic rocks.

In these analyses of schists listed by Clarke the most noticeable feature of their composition is their high iron content. Sometimes this is mainly Fe_2O_3, with little ferrous iron, and sometimes this condition is reversed. In general the iron content runs higher than the calcium and magnesium, but often the condition is reversed. Usually there is not much sodium and potassium, but occasionally there is a fair amount of one or the other, and in most cases there is much more of one of these than the other—a rather surprising condition since in granite in general the silicates of one of these bases is about as abundant as the other.

Since granite tends to stand high in the continental masses and contains but little calcium, magnesium and iron, the high content of these three bases in the schists indicates that they

were formed deep in the earth's crust, whereas if they came from the decomposition of surface rocks they would contain only small amounts of these bases.

Another outstanding feature of these rocks is their high water-content; they seem to have been formed in water, and water is part of them chemically as well as physically; they therefore did not form from a mass of molten rock, but from material that was in a semifluid condition from its high water-content as well as a high temperature.

Such a composition as is found in these rocks shows that these, in most cases at least, never formed by the accumulation of sediments or precipitates. If rock is going to form from precipitation it will be almost pure limestone, but perhaps with some silica, since calcium carbonate is the most abundant salt of river water and the one easiest precipitated. The chlorides and sulphates of sodium, magnesium and potassium are too soluble to be precipitated with calcium carbonate in appreciable amounts. Also when rocks are weathered and their wastes are sorted by water, the calcium is carried into lake or sea and separated from suspended matter. Clarke's figures on the salts of river water show this. Yet some of these analyses show extraordinarily high quantities of calcium.

Finally (for here) their richness in iron, calcium and magnesium proves beyond the shadow of a doubt that the material that composes them was not derived from typical surface rocks. The most abundant rock of the upper earth, as has been said several times, is granite: rich in silica and alumina and with a high sodium and potassium content; low in iron, calcium and magnesium. Yet the metamorphic rocks are usually high in iron, calcium and magnesium. Under the granite of the upper earth is the basalt, and under that the lava and other volcanic material, like basalt in composition.

Even if basalt and volcanic material were abundant at the surface of the earth, their weathering would so separate the soluble substances from the insoluble that the rocks formed would not have the composition of the metamorphic rocks. And if they were formed from sediments, those sediments

would be laid down on the continental shelf at the edge of the lands instead of rising in great masses far inland.

Before continuing with the general case one or two special types of metamorphic rocks merit attention. Six analyses of mixed carbonates are given by Clarke. In two no silica or alumina is reported. In the others the silica content varies from 23.9% to 28.86%. It is low. The ferric iron is low in comparison with ferrous iron, where the content of the top four varies from 32.85% to 45.34%, and there is only 8.80% of CaO. The rock is nearly all iron carbonate, with some manganese and cobalt. But in general the most interesting fact is that the rock is mainly a mixture of iron, magnesium and calcium carbonates.

Calcium carbonate in river water is soluble; magnesium and iron carbonate are not. Yet here is a mixture of these three carbonates. They did not form in surface solution; they must have formed deep in the earth in a hot solution that contained great quantities of carbon dioxide.

The matter is particularly interesting to this writer, since his home for most of his adult life has been close to the line where the foothills of the southern Sierras meet the edge of the San Joaquin Valley; these foothills are almost entirely granite or basaltic, and in some of the latter there is much magnesite, magnesium carbonate. This used to be mined in places here. Since these hills are plutonic, coming up from deep within the earth's crust, the carbonate must have been formed within the earth.

The origin of dolomite merits notice in this general connection. This is not a mixture of calcium and magnesium carbonates, but a salt of calcium and magnesium and carbonate, usually accompanied by some extra calcium carbonate. Although calcium carbonate is very soluble where there is an excess of carbonic acid, magnesium carbonate is not, except under high temperatures. Yet dolomite is abundant in places; mountains are formed from it. The only way it could form in great amounts would be in a hot solution, deep in the earth or in a hot 'water-glass' ocean, rich in silicates, carbonates and other salts.

What the case seems to come to is this: these schists (and carbonates) cannot have come by the weathering of ancient rocks and the accumulation of their wastes. Their composition and position show this. They must have existed deep in the earth's crust, down where iron, magnesium, and calcium are abundant, and that would be below the base of the granite; and they must have been forced upward to the surface in some tremendous disturbance to the face of the earth, and that not long ago. In no reasonable way whatever can an explanation be provided for them in ages-geology, but they point to just the kind of origin and history of the globe that Deluge geology offers.

It is either that or pure miracle in the making of the globe and its making over a long time after plants, animals and men lived upon it. 'Pay your money and take your choice.' But if you do, make your choice reasonably.

Modern Volcanism

In approaching the end of this study it seems well to mention several other features of geology which anyone can learn about in general reading, if not by viewing them directly. The two following are taken from a single issue, January, 1954, of one of the best known monthlies in America, *The National Geographic Magazine*.

Here is what is said in part by Robert S. Dietz on "The Explosive Birth of Myojin Island," near Japan: "Myojin has been trying to build an island for years . . . .

"Myojin's cloud of steam and sulphuric fumes here billows skyward. Lava heated to an estimated 1,700°F. . . ."

And here is part of what is said on volcanism in general: "Many islands, among them the Aleutians and Kuriles, were born of volcanoes belonging to the so-called Ring of Fire encircling the Pacific. . . .

"A blast heard 3,000 miles destroyed Krakatau Island in Sundra Strait in 1883; 36,000 people perished. Krakatau exploded again last October.

"In 1912 a powerful explosion shattered Mount Katmai

on the Alaskan Peninsula. Its eruption scattered dust across North America and cooled an entire summer. Rains of sulphuric acid destroyed Canadian vegetation; fumes tarnished brass as far south as Washington State."

Here is sulphuric acid, or sulphur in a form that becomes sulphuric acid, pouring forth in enormous quantities from almost every kind of volcanic activity. The ocean would contain many times as much sulphate as it does, if the earth were hundreds of millions of years old, or even a few million years old.

Here is volcanic activity breaking out violently in many places: Krakatau exploding a little more than 70 years ago, with what is said to have been the loudest noise ever made on earth and exploding again in October, 1953—this on an earth made over where the lands stand about 4,000 years ago, and with volcanism given full freedom to operate ever since. One would think it would be pretty well played out after 4,000 years. to say nothing about 3,000 million years or very much less time than that.

Some Sedimentary Formations

In connection with sedimentary formations a finely illustrated account of the Mighty Walls of Zion (National Park, Utah) should show any thinking person how impossible it would be for common processes to bring about conditions like these.

Quoting from page 50: "At the Temple of Sinawava the canyon walls are cut through sandstone 2,000 feet thick. . . .

"Formations of six geologic epochs are prominently displayed in Zion Park. The youngest, and therefore the uppermost, is the Carmel limestone. . . . This 200-to-300-foot layer, light gray to buff in color, was the floor of a shallow sea, perhaps 120 million years ago. . . .

"Beneath is the Najavo sandstone, which in Zion Park is more than 2,000 feet thick. . . ."

All of this is part of the Grand Canyon series of formations with the rocks supposedly laid down much later than

the rocks bordering the Grand Canyon at that National Park. The stream running through Zion Park enters the Colorado above the Grand Canyon.

Here in Zion Park is sandstone 2,000 feet thick or more, not that thickness of hardened mud such as might be laid down on the floor of a deep inland sea or in an estuary at the mouth of a great river, but grains of silica held together by a cement of calcium carbonate. According to ages-geology this sandstone would be laid down through millions of years in an inland sea, and after it was laid down a layer of calcium carbonate 200 to 300 feet thick would be deposited and then the whole uplifted for thousands of feet above sea level.

Mention of one more thing is in order here. The north fork of the Virgin River along which most of the pictures given were obtained carries a heavy load of sediment: "Each year the river carries 300,000 tons of eroded rock out of the park," and it is a small stream except when it is in flood. The Colorado River carries an average of nearly a million tons of sand and silt past any given point within Grand Canyon each day. (Statement in booklet from National Park Service.) "The Virgin's rushing waters fall 90 feet to the mile. This drop is 10 times as steep as that of the Colorado River in Grand Canyon National Park" (*National Geographic Magazine*). With that rapid cutting of the stream beds in the area, the lands were not uplifted any million years ago or more, as ages-geology calls for. If they were the river beds would by now be cut far deeper than they are.

Look at the face of the lands; think how they came to be as they are. Recent uplift after a great deluge is the only explanation for them that seems reasonable.

Post-Deluge Climates

Considering the possibility that the Deluge actually occurred and that it was caused in part by the breaking up of portions of the earth's crust by the steam and other gases within the crust, the problem of the nature of the climate over the earth following the Deluge calls for careful attention.

That there have been great changes in climate over parts of the earth in the past few thousand years is admitted and undeniable. Many parts of the world that are deserts today were well watered, not in the distant past alone, but only a few thousand years ago, since civilization began.

Since it seems improbable that great changes in the elevation and contours of the land could have taken place recently or that the sun can have sent materially less heat or light to the earth in such a short period of time, some radical change in the composition of the atmosphere must have been responsible for the changes in climate that have occurred. Also, if our present lands and oceans had been about as they are for a million years or so, as postulated by ages-geology, which holds that there was much uplift of the lands about that long ago, the climates of the earth should have reached about their present condition long before the last few thousand years.

The making over of the face of the earth—at least where the great land masses now stand—at the time of the Deluge would, however, cause the early postdiluvian climate to be far different from the present climate, and our problem now is to look into this.

In the first place, granting a universal deluge, the temperature of the ocean at the start of postdiluvian time would be warm everywhere. There would therefore be no extremes of temperature anywhere, except between high mountaintop and lowland, until the water of polar oceans had cooled to near the freezing point.

Next, entirely aside from how much carbon dioxide there had been in the atmosphere of the antediluvian earth immediately preceding the outbreak of the Deluge, there would be a large quantity present after it was over. This is because of the way that great quantities of methane and carbon dioxide and other gases of volcanism would issue from within the earth as the lands were broken up and volcanic islands were uplifted. An ocean warm throughout would cover the earth except where the lands stand, and both lands and ocean

would be covered with a warm, moist atmosphere, rich in carbon dioxide, that would blanket the earth against a rapid loss of heat from the surface. With a moist, warm climate everywhere and an atmosphere rich in carbon dioxide, plants could grow luxuriantly for some centuries at least, or at least until the Arctic Ocean could accumulate a covering of ice. Later, as the carbon dioxide was used up and volcanic activity slowed down, plant growth would slacken. Then a revolution in the climates of the world would develop.

Some facts about climatology should be mentioned in this connection. A water surface tends to prevent temperatures from dropping seriously overnight or over a winter, but a rock surface can cool quickly. Over an unfrozen polar sea the temperature will not fall much during a long night, but over a great stretch of land in Siberia or Alaska the cold may be intense. A covering of ice acts like an expanse of land. After the Flood the temperature of the air over the Arctic would be moderate, winter or no winter, until a sheet of ice had formed, to prevent the ocean water from keeping the temperature moderate.

Then the greatest break in the history of world climates would come. There would be a great change in temperature between north polar regions and the temperate and tropical regions. Great movements of air would develop, with great storms. Climates over large areas would be revolutionized.

Things would be somewhat different in the Antarctic. There a great expanse of land covers the pole and much of the area around it. Also much of the land there is very high and a snow cap could form on it quickly. On the other hand there is little to prevent the movement of ocean water between the Antarctic continent and temperate and tropical area. Climates in the southern hemisphere would therefore doubtless change gradually after the Deluge.

In the north, however, the Arctic Ocean occupies all the areas far south of the pole, but Eurasia and North America prevent almost all movement of ocean water southward or northward over most of the area—little water can move

through the narrow and shallow Bering Straits—and the amount of water that can move northward and southward between Europe and North America is small.

In the process of time, therefore, the warm water of the early Arctic Ocean would become cold; finally, during a long winter it would freeze over and lose its ameliorating effect upon the temperature, and a sudden and revolutionary change would occur in northern regions, and in fact, over all the north temperate part of the world.

It is generally known that part of Siberia rather than the region close to the North Pole is the coldest area in the northern hemisphere. Yet Siberia some thousands of years ago was the home of enormous numbers of elephants (mammoths) and other large animals, and these were destroyed abruptly as if by sudden blizzard. A similar condition seems to have taken place in Alaska. Mammoths have been found buried in frozen earth with undigested food in their stomachs and their flesh so well preserved that it could be eaten by dogs.

Some upholders of the Deluge theory have supposed that they may have been destroyed by the Flood, but this is out of question. The bodies of the animals would be afloat for almost a year if the Flood had destroyed them and they would have been above a freezing temperature, and so, decayed for decades or centuries if they had been killed by the Flood. The only possible explanation for them is that these were animals who lived long after the Flood and were destroyed by a sudden, severe blizzard which initiated a radical change in the climate of the northern part of the world. That seemingly could only have taken place by the freezing over, for the first time, of the Arctic Ocean.

Other great changes have occurred, as has been stated a few paragraphs earlier, in parts of the world. It is often said that the world is drying up; at least part of it is. In the basin where the Salt Lake now stands was great Lake Bonneville a few thousand years ago. The rainfall must have been several times as great then as now. In the Great Basin country generally, in parts of California east of the Sierra Nevada Mountains, in Nevada, southeastern Oregon and elsewhere many

great shallow lakes stood not long ago, like Lahontan in Nevada and Owens Lake in California. Southern Nevada, now almost desert, seems to have been well watered in the not very distant past. Greenland was far warmer than it now is even when Eric the Red discovered it, and the glaciers of the Alps extended far lower than they do now. Parts of Northern Africa that are now almost uninhabitable, even by impoverished nomads, supported a civilized people long ago. Even after the rise of Christianity much of Central Asia, which can support only a small population now, had a large and flourishing population. Truly parts of the world are drying up.

The change must have come about, for all that can be seen, by the change from a world in many respects like the antediluvian world immediately after the Deluge to a world of extremes of climate. Over the world as a whole there is less moisture in the air now than there once was and great areas are both colder and drier than they were. Volcanic activity has slowed down greatly, and there is less carbon dioxide in the air; plants have neither as much moisture as they formerly had, nor as much carbon dioxide in the air to grow with. The world is running down rapidly. Presumably it will soon come to an end.

The Near End of the World

As this study draws to a close, the extraordinary importance of volcanic activity in earth processes should be emphasized. Speaking from a naturalistic viewpoint only, unless a moderate amount of volcanic activity continues this world will soon be a comparatively lifeless thing. Rains may fall, winds blow, day follow night and summer follow winter, but in the process of time little life will exist upon the land or in the sea.

The reason that volcanic activity is so important to plants, and therefore to animals, is obvious once a person thinks about the matter. The substance most used by plants, after water, is carbon. Much sulphur is also used by them. These,

with water (composed of oxygen and hydrogen), nitrogen, phosphorus, calcium and a few other elements, make up plant tissue and therefore animal tissue. When the supply of these plant foods runs short, plant growth must be reduced too, and volcanic activity is the main, and as far as purely natural processes are concerned, almost the only real source of two elements, carbon and sulphur. Also, and note this, the amounts of carbon and sulphur available to land plants at any one time is almost unbelievably limited. No easily available reserve exists to draw upon.

This is not true of marine plants, for sulphate salts are plentiful in the ocean and much carbonic acid is also dissolved in sea water and available for the use of seaweed and other marine vegetation, so for a long time after volcanic activity ceases and only traces of carbon dioxide remain in the air and traces of sulphur remain in soils, marine plants can probably get enough carbon dioxide to remain alive and make some small growth. Small amounts of both carbon and sulphur also enter the atmosphere in meteors, but the amounts are too small to do more than keep a few simple plants alive and to allow them to make a little growth.

As was said earlier, the amount of sulphur and carbon dioxide available to plants at any one time is very small. Although sulphur is abundant deep in the earth in combination with iron and other metals, and in places there is much gypsum, a form of calcium sulphate, rocks in general contain little of that element. When there is some sulphur in rocks and they weather, the sulphur oxidizes to sulphate, which is easily leached from the land. As a result almost the only sulphur found in soils is contained in the humus and other former plant tissue. The sulphur that keeps plants going, save as farmers apply it to the land, is what comes to the soil in the air. That comes mostly either from volcanism or the combustion of fuel or other human activity, or from the disintegration of organic material.

The amount of carbon dioxide in the air is amazingly small as compared with the amounts taken from the air by

plants. Over a square inch of land at or near sea level there is approximately 14.7 pounds of air, and of this only about 4/100 of 1 per cent by weight is carbon dioxide, and that is very little. If a sheet of ordinary writing paper were lying on the ground the carbon in the air above the paper would be just about as much as the amount in the paper. A fair growth of grass on ordinary pasture would take more than that much carbon from the air in a season. Therefore the only thing that keeps plants growing is the addition of carbon dioxide (and sulphur dioxide) to the air and thence to the land. When these cease to enter the air in great amounts plants will stop growing, and from present indications both sulphur and carbon dioxide will soon quit entering the air, save in very small amounts. The world of living things will then practically come to an end.

Also not all the sulphur and carbon taken up by plants gets back to the soil to be used a second and third time, by any means; there is always a big waste. Much carbonic and sulphuric acid in the air falls into the ocean or into rivers which flow into the sea. Some carbonic acid may enter the air again, but almost no sulphate will. It remains there mostly as magnesium or potassium sulphate.

Much of these materials that falls on the land also is not taken up by plants but goes to disintegrate rocks and unites with calcium, potassium or some other base and is leached from the land and carried in streams to the sea. The amounts so lost are enormous according to figures from Clarke's *Data of Geochemistry*, mentioned earlier. Nine hundred sixty one million metric tons of CO_3 are carried in rivers to the sea per year, and 332 million tons of SO_4. It is true that not all of either of these comes from the air, but a large part of it does. That is particularly true of sulphur. Great quantities of carbon taken up by plants also go down brooks and rivers as organic matter and are buried in bays, estuaries, marshes or deposits on sea floor. The only thing that keeps enough carbon and sulphur in the air (and soil) is the addition of carbon and sulphur to the air from volcanic activity or some other

source. This fact cannot be emphasized too much, particularly since the fact has been overlooked to the extent that it has been.

Probably as much sulphur enters the air now from the consumption of coal and petroleum and from smelting and other industrial processes as enters the air from volcanic activity of various kinds, and more carbon probably enters the air in that way than from volcanism. This extra carbon and sulphur in the air in the nature of the case makes plants grow far more vigorously than they otherwise would. We therefore must thank modern industrialism not only for providing many times as much energy as men and animals could provide and making great technical progress besides, but for stimulating plant growth immensely too, thus enabling the lands and seas to feed far more people than they otherwise could.

Nevertheless when coal and petroleum and the reserves of sulphur play out and the oxides of carbon and sulphur no longer enter the air from this source, save in small quantities, a radical reduction in plant growth for the lack of these two elements will be inevitable, and all the efforts that man can make will not keep plants growing enough to provide food for more than a small fraction of the men and animals that live on earth today. This is almost as certain as any statement could be.

And reserves of these materials are almost certain to be near exhaustion before long, say in a few decades, or perhaps in two or three generations. Sulphur is being used so extensively in modern processes of many kinds that it may run short long before our coal and petroleum do. Special efforts may give mankind enough sulphur to keep going after a fashion, but a shortage in the air will mean a great reduction in plant growth just the same. The way that the rivers carry sulphur and carbonate to the sea indicates what a great amount of these two materials is needed by plants and by the world in general.

Long ago when our coal vegetation was growing, the drain on the atmosphere of both carbon and sulphur must have been enormous. Plant biologists have estimated that the car-

bon dioxide content of the air when coal vegetation was growing vigorously must have been not far from five percent, as compared with a very small fraction of that amount now. The only thing that permitted such growth to continue must have been the emission from the earth of great quantities of carbon dioxide or other forms of carbon that would oxidize into that, from geysers, mineral springs and other forms of mild volcanic activity. That must have been in the youth of the earth, and not many thousands of years ago.

But it is also apparent that such a great flow of water and other gases from within the earth could not continue long. Then too after the close of the Deluge period and the great crustal disturbances connected with it, allowing the deep-seated steam and other gases within the upper earth easy access to the surface, there must have been a great and continual slowing down of volcanic activity and less and less carbon and sulphur brought to the surface, and less and less carbon dioxide in the air. Also the climates of the world immediately following the Deluge must have been very different from those of the present, but that has been discussed already.

Evidences of this reduction in volcanic activity are abundant. Numerous extinct volcanoes that were active not long ago exist on every continent. (There are not many in Australia, but there are some). Volcanic islands are found here and there over the oceans, being very numerous in many places, including the East and West Indies, off Eastern Asia and in the Western and South Pacific generally. Only on a small fraction of these islands are there active volcanoes, but from all appearances nearly all were active a few thousand years ago and still more recently.

In the United States, although Lassen in northeastern California still sends out steam, there are no active volcanoes now, but little more than a century ago St. Helens in Western Washington was in violent eruption and pouring out great streams of lava. The Crater Lake country in southeastern Oregon also gives evidence of great activity not long ago, and in the Southwest several craters exist where eruptions took

place since Columbus discovered America. Volcanic activity is slowing down rapidly.

There is no question whatever but that as volcanic activity slows down, the supply of carbon and sulphur for plant growth will be reduced critically, particularly since at the same time the consumption of coal, petroleum and other fuels will be radically reduced too. Then man's experiment on this globe will have to come to an end. This is with the proviso that society does not destroy itself before then, as seems probable.

This forecast of what seems certain to happen is presented upon a purely naturalistic basis. However, if the world came into being and operates by the will and plan of a Creator a different kind of an end is probable. In fact it is not at all improbable that the failure of sulphur and carbon and the ruin of society by the wickedness and folly of mankind will take place more or less simultaneously.

God seems to have made man in his own image and highly endowed, but man has used his God-given powers for his own destruction. At no previous time in history have men had such power to use what we call Nature for the benefit of humanity; but the more they can use Nature, the more they turn good to evil. Whether the world operates naturally or came by Creation it is still certain that the end is near, both because of the folly of mankind, the exhaustion of natural resources and the playing out of volcanic activity.

More on the Recent Uplift of the Lands

More and more evidence continues to develop to show that present lands arose from below sea level only a few thousand years ago. Thus the statement is made in the *Scientific Monthly* for October, 1954, by Preston E. Cloud, Jr., of the U.S. Geological Survey in a paper on "Superficial Aspects of Modern Organic Reefs" that there was a "world-wide 5- to 6-ft. fall of sea level that began about 3000 (±1500) years ago, coupled with slight recovery from the

lowest point of fall, beginning a century or so ago." This fall in ocean level is attributed, reasonably, to the removal of sea water by evaporation and the deposit of that water upon the ice caps of Greenland and Antarctica.

Note how recently that water left the ocean: 3000 years ago, plus or minus 1500 years, and in the nature of the case more than 3000 years ago rather than less. This would seem to bring the time that the surface of the ocean started to fall something like 4000 years ago, a time that suits Deluge geology and Ussher's chronology admirably, and we have already noted that 4000 years ago seems to have been an important time in the earth's history.

This paper is illustrated with many pictures of parts of tropical islands which show that long ago the level of the ocean was five or six feet higher than it is now. This presumably was immediately following the uplift of the islands, although no estimate seems to have been made of the length of time that the ocean retained its then level; but at that level wave action cut into the shore line and left other evidence of its presence.

Later it dropped five or six feet and started cutting into the land again. Then about a century ago it started to rise slightly. The cause of the dropping, as was said, is believed to have been the evaporation of sea water and its deposit as snow or ice on the ice caps of Greenland and Antarctica. The recent small rise of sea level is held to have been due to melting of ice from those ice caps and from glaciers in other parts of the world.

But note the implications of this on the ice-age theory in relation to the Deluge theory. By the ice age theory the removal of water from the ocean and its deposit as ice on land would start a million or so years ago; or even if the ice sheets began to form only a few tens of thousands of years ago, the time of the fall of ocean surface would be in the very distant past and not 3000 years ago, plus or minus a few centuries. Also, if the present ice sheets had been in existence even a

few tens of thousands of years ago, there would not have been, for all that geologists can see, any reason for a sudden growth in these ice sheets only a few thousand years ago.

In fact, geologic theory is that some thousands of years ago ice covered so much of North America and Europe that the ocean contained appreciably less water than it does now, so that the melting of this ice would cause the sea level to rise, *not to fall.*

By Deluge geology on the other hand the land areas of the present world rose above sea level only a little more than 4000 years ago, taking Ussher's chronology as correct in principle, causing sea level to be somewhat higher than it is now, and ocean water in the high latitudes much warmer than it is now. Although snow doubtless would fall at high levels in both Antarctica and Greenland, not until the polar seas became cold and ice formed over parts of the ocean would a quick growth of glaciers begin there. Then there would be a fairly rapid fall in sea level until the accumulation and loss of ice in these areas reached an approximate equilibrium.

The situation therefore seems not only to discredit conclusively the ice-age theory in favor of Deluge geology, but it seems to indicate that Ussher's estimate for the date of the Deluge is approximately correct.

Worthy art Thou, O LORD, to receive glory and honor and power: for thou hast created all things, and for thy pleasure they are, and were created. Revelation 4:11.

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